ECHNOLOGY DEPT.

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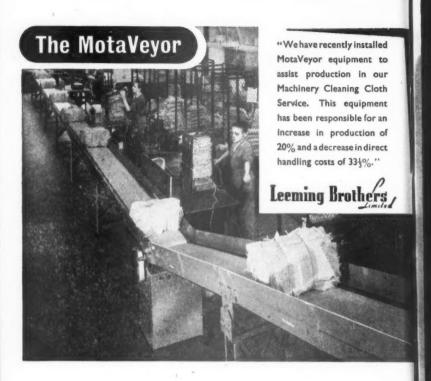
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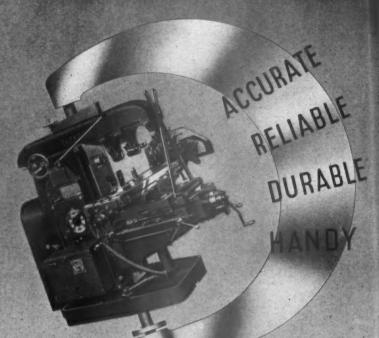


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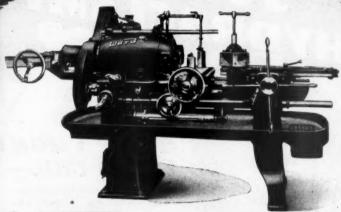
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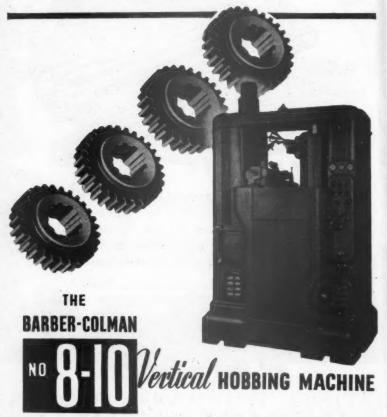
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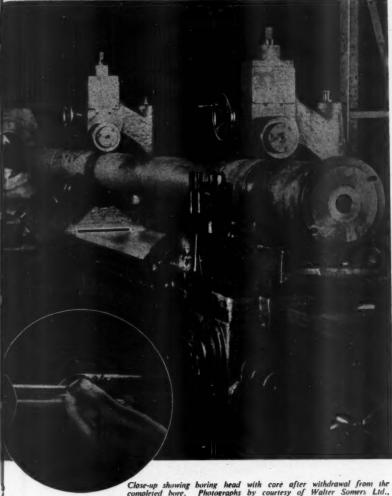
The illustration shows a 50 ton tensile nickel chrome molybdenum steel component 23" 6" long, bored 3.1" diameter. Wimet tools operating at a cutting speed of 550 f.p.m., feed 0.008" per rev., complete one bore every 50 minutes on a production basis, tool life averaging 4 bores per regrind. Nearly 100 ft. of bore from one Wimet tool!

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Close-up showing boring head with core after withdrawal from the completed hore. Photographs by courtesy of Walter Somers Ltd., Birningham.

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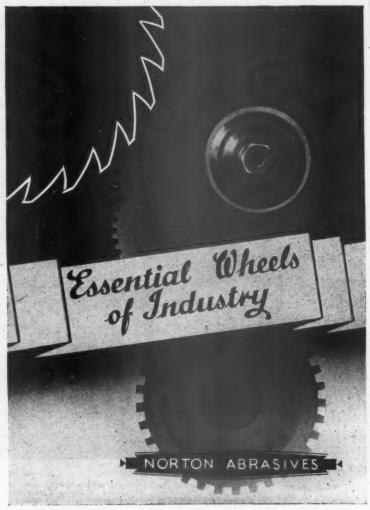
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This photograph taken on the Institution's Stand at the recent Mechanical Handling Exhibition, Olympia, shows (left to right): Dr. H. Schofield, C.B.E., Past President of the Institution; Mr. Walter C. Puckey, Chairman of Council; Mr. R. C. Fenton, Member of Council; Mr. E. Percy Edwards, Chairman, Membership Committee; and Mr. W. F. S. Woodford, Acting Secretary.

SCHOFIELD TRAVEL SCHOLARSHIPS

The Institution is pleased to announce that applications are now invited for the 1951 Schofield Travel Scholarships.

These scholarships were awarded for the first time in 1950, when the two successful Graduates, Messrs. B. E. Stokes of Birmingham, and W. N. Aspinall of Rugby, were selected for six months' study visits to industrial concerns in the United States of America.

It is intended to offer two scholarships for 1951, which will entitle one Graduate to visit the United States of America, and one to Switzerland. It is proposed that each of these study visits shall be of six month's duration, and that each scholar shall have an opportunity of carrying out his project in two or three firms.

Objects of the Scholarship Scheme.

- (i) To provide facilities whereby young production engineers are given an opportunity of broadening their outlook and of improving their knowledge of production functions, both technical and managerial.
- (ii) To improve productivity in this country by the implementation and dissemination of such knowledge.
- (iii) To stimulate interest in production by offering these facilities.
- (iv) To help to foster a better understanding of the modes of life, social conditions, and, in particular, of the production methods employed in the industries of the United States of America, European countries, and such other countries as may from time to time appear desirable.

Conditions for the 1951 Scholarships.

- (i) Two scholarships will be offered, covering a period of six months. Council reserve the right to make no award if the entries are not considered to be of sufficiently high standard.
- (ii) Graduates entering for the scholarship must have attained their 23rd birthday, but not have passed their 30th birthday, on the 1st January, 1951. No graduate who was elected after 1st January, 1949, will be accepted as a candidate.
- (iii) Application forms may be obtained from the Head Office of the Institution, and should be completed and returned by candidates not later than 15th October, 1950.

(iv) Successful candidates will be required to devote the whole of their time abroad to the project which they have selected. On their return they will be required to read a paper to their Sections and to report on their projects in any other way which may be considered desirable by the Institution.

Selection Procedure.

- (i) Preliminary selection will be carried out by Section Committees, who will take into consideration reports submitted by employers and educational establishments.
- (ii) Candidates who satisfy these preliminary selection Committees will proceed to the next stage, which involves the preparation of a paper on the project which they propose to carry out if awarded a scholarship.

Such papers should give a detailed background of the candidates' knowledge and experience, which they consider will enable them to make a profitable investigation of their selected subjects.

The projects should have a direct bearing on production and, in particular, on that aspect of it with which the candidate is concerned at the time of entering for the award.

(iii) After assessment of the papers submitted, certain candidates will be selected to attend a final group interview.

IT IS IMPORTANT TO NOTE THAT AT ALL STAGES OF THE ABOVE PROCEDURE THE PERSONAL QUALITIES OF CANDIDATES WILL BE GIVEN EQUAL CONSIDERATION WITH THEIR ACADEMIC AND INDUSTRIAL ATTAINMENTS.

INSTITUTION NOTES

September 1950

The next Meeting of Council will be held on 26th October, 1950, at 36, Portman Square, London, W.1 at 11 a.m.

ENGINEERING METROLOGY

This course, at the College of Technology, Manchester, provides an opportunity for a study of the science and practice of measurement in Mechanical and Production Engineering, and in scientific and industrial research.

Candidates for admission to the course must possess a University Degree in Engineering, Physics or Mathematics, or a Higher National Certificate or Diploma in Mechanical, Electrical or Production Engineering.

A College Certificate will be awarded on the satisfactory completion of the Course, and this session, new laboratories will provide opportunities in particular for the extension of the large scale metrology associated with machine tools and other structures.

The course will commence on 5th October, 1950, and early application to the College is advisable, as the number of places is limited.

I.Prod.E. EXAMINATION
At a Meeting of Council held on 20th January, 1949, it was agreed that all candidates who completely satisfied the Graduateship Examination requirements, or gained complete exemption from them, before 1st September, 1950, and are elected Graduates or make application for election before that date, may be deemed to have satisfied the examination requirements of the Institution in all respects.

When the time comes for their application for transfer to the grade of Associate Member, they may not be asked to undertake any other examination or part of an examination.

APPOINTMENTS

Applications are invited for the full-time post of Lecturer in Production Engineering subjects, together with Workshop Practice. The work will be concerned with Higher National Certificate Courses in Production Engineering and the City and Guilds of London Institute requirements.

Applicants should possess sound technological qualifications, good industrial and teaching experience in such subjects as Machine Tools, Jigs and Fixtures, Metrology, Welding Practice and Heat Treatment. Salary will be Burnham Scale with additions for teaching and industrial experience.

Forms of application may be obtained from the Registrar, Weybridge Technical College, Heath Road, Weybridge, Surrey.

NEWS OF MEMBERS

Mr. D. A. Craven, Graduate, is now Works and Production Manager with Caplin Engineering Co., Ltd., London.

Mr. R. C. Dobbs, Associate Member, having terminated his period of secondment on advisory duties with the Department of Supply, Commonwealth of Australia, has now returned to the Royal Ordnance Factory, Nottingham, where he is Shop Manager.

Mr. F. C. Evans, Intermediate Associate Member, has joined The Vacuum Oil Company, Ltd., Newcastle-upon-Tyne, as Automotive Engineer.

Mr. A. L. Martin, Associate Member, has been appointed Senior Lecturer in the Department of Engineering at the Wednesbury County Technical College.

Mr. Henry Rodwell, Associate Member, has resigned his appointment as Works Manager with L. S. Mayer (London), Ltd., Dundee, to set up his own business, H. Rodwell & Company, Ltd., in London.

Mr. H. M. Thompson, Member, until recently General Works Manager of Davey-Paxman, Ltd., Colchester, has now set up his own business, H. Morfin-Thompson, Ltd., Grantham.

OBITUARY

The Institution deeply regrets to record the death of Mr. W. G. Maw, Member, of Western Section.

BRITISH STANDARDS The following Standards have recently been issued and are obtainable from the British Standards Institution, 28, Victoria Street, Westminster, London, S.W.1, at the prices indicated.

- 292: 1950 Dimensions of Ball Bearings and Parallel Roller Bearings (price 6/- post free).
- 482:1950 Wrought Iron and Mild Steel Hooks (price 5/- post free).
- 870: 1950 External Micrometers (price 2/6 post free).
- 1127: 1950 Circular Screwing Dies and Hexagon Dienuts (price 1/- post free).
- 1620: 1950 Dimensions of Screen Magnetos (G, K and M types) (price 2/6 post free).
- 1635: 1950 Graphical Symbols for Fire Protection Drawings (price 3/- post free).
- 1639: 1950 Notes on the Simple Bend Test (price 2/- post free).
- 1641: 1950 Cast Iron Fipe Fittings for Sprinklers and other Fire Protection Installations (price 2/6 post free).

1642: 1950 Ball and Roller Bearing Plummer Blocks (General Purpose Series) (price 1/- post free).

I.Prod.E. representative on B.S.I. Committee supervising the preparation of the foregoing standards: Mr. J. E. Baty.

1651: 1950 Industrial Safety Gloves (price 4/- post free).

I.Prod.E. representative on appropriate Committee: Mr. U. F. T. Norris.

BOOKS RECEIVED "Machinery's Screw Thread Handbook."
Machinery Publishing Co., Ltd., London.

This new edition has been completely revised, and for the first time contains details of the Unified Screw Thread System.

"Tube Works Gauges and Gauging Practice." Published by Stewarts & Lloyds, Ltd., Glasgow. Price 5s. net.

This book has been prepared for the use of the Company's trainees in conjunction with practical work.

"Estimating and Planning for Engineering Production" by P. S. Houghton, A.M.I.M.E. Blackie & Son, Ltd. Price 25s. net.

"Welding Design and Processes" by B. Richard Hilton. Chapman & Hall, Ltd., London. Price 36/- net.

This book covers a very wide field in the technique of welding, but is primarily concerned with the design for welding; many illustrations are given in this respect. The nomenclature adopted is consistent with British Standard Specifications.

The weldability of materials and heat treatments are well covered. The many tables set out will be found most useful to the designer and those interested in welding technique. A comprehensive treatment of processes, together with illustrations, is most instructive. A.R.

"Modern Welding Technique" by E. T. Gill and Eric N. Simons. Sir Isaac Pitman & Sons, Ltd., London. Price 21/- net.

"A Philosophy of Production" by Francis B. Willmott. Christopher Johnson Publishers, Ltd., London. Price 7/6 net.

Centenary Catalogue—1850/1950; Railway Permanent Way Fastenings Catalogue; Grooved Pins and Studs Catalogue. Published by Exors. of James Mills, Ltd., Stockport.

JOURNAL Members are reminded that binding cases for the BINDERS Journal are obtainable from Head Office, price 7/6 each post free. The cases, each of which will hold 12 issues of the Journal, are made of stiff board covered with imitation leather cloth, with gilt lettering on the spine.

SECTION MEETINGS

The following meetings have been arranged to take place in October, 1950. Where full details are not given these have not been received at the time of going to press.

October

- 3rd Reading Sub-Section. A lecture on "Electronics in Industry" will be given by Dr. E. J. B. Willey, D.Sc., Ph.D., F.R.I.C., at the Great Western Hotel, Reading, at 7-15 p.m.
- 4th Nottingham Section. A lecture on "What is wrong with British Industry" will be given by Mr. Lewis C. Ord, at the Victoria Station Hotel, Milton Street, Nottingham, at 7-00 p.m.
- 6th West Wales Sub-Section. A lecture on "British Clocks and Watch Production" will be given by Mr. Robert Lenoir, F.B.H.I., at the Central Library, Alexandra Road, Swansea, at 7-30 p.m.
- 7th North Eastern Graduate Section. A works visit to Pyrotenax, Ltd., Hedgeley Road, Hebburn, Co. Durham, will take place at 10-00 a.m.
- 9th Halifax Section. A lecture on "Costing as an Aid to Management" will be given by Mr. H. H. Norcross, A.I.Prod.E., F.C.W.A., F.I.I.A., at Whiteley's Cafe, Westgate, Huddersfield, at 7-15 p.m.
- 9th Liverpool Graduate Section. A lecture on "Graduate Status—Its Responsibilities and Implications" will be given by Mr. T. B. Worth, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., at the Exchange Hotel, Liverpool, at 7-45 p.m.
- 9th Sheffield Section. The Opening Meeting will be held at the Royal Victoria Station Hotel at 6-30 p.m. Address by Major-Gen. K. C. Appleyard, C.B.E., D.L., T.D., J.P., M.I.Mech.E., A.I.M.E., A.M.I.Min.E., M.I.Prod.E., President of the Institution.
- 9th Yorkshire Section. A lecture on "Colour Schemes in Industry" will be given by Mr. S. A. Wood, at the Hotel Metropole, Leeds 1, at 7-00 p.m.
- toth Dundee Section. A lecture on "The Measurement of Productivity" will be given by Mr. W. C. Puckey, M.I.Prod.E., F.I.I.A., at Mathers Hotel, Whitehall Crescent, Dundee, at 7-30 p.m.
- Birmingham Graduate Section. A lecture on "Modern Methods and Developments in Heat Treatment Practice" will be given by Mr. K. J. B. Wolfe, M.Sc., F.R.I.C., F.I.M., at the James Watt Memorial Institute, Great Charles Street, Birmingham 3, at 7-00 p.m.
- Manchester Graduate Section. A lecture on "Foundry Control" will be given by Mr. H. A. Fox, at Reynolds Hall (Room C.3), College of Technology, Sackville Street, Manchester, at 7-15 p.m. The lecture will be illustrated by lantern slides.
- 11th Liverpool Section. A "Brains Trust" will be held at the Exchange Hotel, Tithebarn Street, Liverpool, at 7-15 p.m.
- Western Section. A lecture on "British Management at the Crossroads" will be given by Mr. Lewis C. Ord, at The Grand Hotel, Broad Street, Bristol, at 7-15 p.m.
- 12th Southern Section. A lecture on "Efficient Tooling for Production" will be given by Mr. B. Holloway, M.I.Prod.E., at the Polygon Hotel, Southampton, at 7-00 p.m.
- North Eastern Graduate Section. Address by the Section President, Mr. R. W. Mann, M.I.E.E., M.I.Prod.E., at the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, at 7-00 p.m.

October-cont.

- 16th Derby Sub-Section. A lecture on "Electronic Control of Machine Tools" will be given by Mr. S. A. Ghalib, B.Sc., A.M.I E.E., at the School of Art, Green Lane, Derby, at 7-00 p.m.
- 16th North Eastern Section. A lecture on "Costing for the Smaller Engineering Firms" will be given by Mr. J. H. Smith, F.S.A.A., F.C.I.S., at the Neville Hall Mining Institution, Westgate Road, Newcastle-upon-Tyne, at 7.00 p.m.
- Wolverhampton Graduate Section. A lecture on "Plastics" will be given at Willenhall Evening Institute, Stafford Street, Willenhall at 7-15 p.m.
- 18th Edinburgh Section. The Report on Proceedings of the Annual Summer School—"The Science & Practice of Engineering applied to Production"—will be given by Dr. A. F. Muir, A.M.I.Mech.E., A.M.I.Prod.E., at the North British Station Hotel, Edinburgh, at 7-30 p.m.
- Glasgow Section. A lecture on "Materials Handling" will be given by Mr. R. G. Winton, A.M.I.M.E., A.M.I.Prod.E., at the Institution of Engineers and Shipbuilders, 39, Elmbank Crescent, Glasgow, C.2, at 7-30 p.m.
- 19th London Section. A lecture on "The Future of Production Engineering" will be given by Mr. C. R. Whitaker at the Royal Empire Society, Northumberland Avenue, W.C.2, at 7-00 p.m.
- 23rd Manchester Section. A lecture on "Joint Consultation in Industry" will be given at the College of Technology, Manchester, at 7-15 p.m.
- Northern Ireland Section. A lecture on "Production Management's Responsibility for Productivity" will be given by Mr. B. H. Dyson, M.I.Prod.E., F.I.I.A., at the Municipal College of Technology, Belfast, at 7.30 p.m.
- 25th Shrewsbury Sub-Section. A lecture on "Industrial Finishes" will be given by Mr. A. W. Wallbank, B.Sc., F.R.I.C., at the Technical College, Shrewsbury, at 7-30 p.m.
- Lincoln Section. A joint talk by five members of productivity teams on their experiences in America, will be given by Messrs. J. R. Bergne-Coupland, A. E. Sendall, A. Nicholl, H. Smith, H. M. H. Fox, at Lincoln Technical College, at 7-00 p.m. This will be a Joint Meeting with Lincoln Engineering Society.
- Luton Section. A lecture on "Control Chart Technique and Production Efficiency" will be given by Dr. B. P. Dudding, at the Small Assembly Room, Town Hall, Luton, at 7-15 p.m.

SECTION ACTIVITIES

BIRMINGHAM The 1950/51 programme will include a Joint Meeting with the Institution of Works Managers on "The Rôle of the Production Engineer in Industry", and a Joint Meeting with the Royal Statistical Society, (Industrial Applications Section) on the subject "Statistical Aids to Production Engineering." The Birmingham Section are entertaining the Engineering Section of the British Association at a Conversazione in September, 1950.

The working party for Material Handling is making considerable progress under the guidance of Mr. T. W. Elkington and Mr. W. A. Robinson, and are arranging investigations and visits to local works. The Section Summer Convention and Outing took place in June.

Since the last report two Section Meetings have been held, one in April at which a paper entitled "Production Progress in the Foundry Industry" was read by Mr. J. H. King, and the other in May at which a paper entitled "Metals and their Inspection" was read by Mr. A. E. Hook, the Admiralty Inspector of Foundries. Both papers proved extremely interesting and were attended by a large gathering of engineers.

The strength of the Section is now 67, which is considered highly satisfactory. During the month of April, fifteen more applications for election or transfer were considered and submitted to London

for ratification.

Further meetings are to be held at frequent intervals up to the end of November this year.

CALCUTTA At the Annual General Meeting held in April the President and Officers for 1950/51 were elected. In May the reading of Mr. K. C. Mitter's paper entitled: "Tea Machinery and Its Use," was followed by an interesting discussion. In accordance with the usual custom in Calcutta no meetings are held during the hot season.

A number of applications for membership and transfer have

been received and forwarded to London.

There were five candidates for the Graduateship Examination which was held in Delhi.

Arrangements are being made for visits to the factories of the Bata Shoe Company and the India Government Mint.

DUNDEE Since the last report, the Dundee Section Committee has held four meetings. Six applications for membership have been dealt with by the Committee.

Arrangements are being made for the reception of the Work

Measurement Research Survey Unit in October.

Mr. T. B. Worth has made a visit to Dundee and had discussions with the Education authorities.

The Section Annual General Meeting has been held and Officers elected for the 1950/51 Session.

There have been no Lecture Meetings since the last report, but the Committee has met from time to time and has arranged a programme of lectures which promises to be both interesting and instructive.

The Lecture programme for 1950/51 is now complete, and in addition arrangements are being made for a Joint Meeting with the Norwich Section of the Institute of Cost and Works Accountants on "Measurement of Productivity."

The Membership Campaign continues, and reasonable progress is being made.

HALIFAX The Committee continues to meet regularly and it is hoped that the syllabus for the 1950/51 Session, to which much time and thought has been given, will interest all members.

The first President of the Lincoln Section will be Mr. J. R. Bergne-Coupland, Works Manager of Ruston and Hornsby, Ltd., who in 1949 visited the U.S.A. as leader of the Anglo-American Productivity Team on Oil Engine Manufacture.

It is with regret that the Section have had to accept the resignation from the Committee, through pressure of business, of Mr. E. Burgess and Mr. R. H. Pulfrey, whose valuable services are very greatly appreciated.

The Section welcomes to its Committee Mr. R. N. Stallard,

Mr. A. Nicholl, and Mr. E. T. Wakefield.

Council having approved the formation of a Liverpool Graduate Section, preliminary meetings have taken place and a temporary Committee has been nominated.

Mr. T. B. Worth gave his paper on "The Education of the Production Engineer" to a meeting attended by representatives of the Liverpool University, the technical colleges and the educational authorities, and the lecture was followed by an interesting discussion.

The present strength of the Liverpool Section is 161, with a number of applications for membership still under consideration.

The Annual General Meeting was held in March when the Fresident, Mr. W. Core, who has been re-elected for the coming Session, reviewed progress and referred to the possible formation of Sub-Sections. Mr. Core thanked members of the Committee for their efforts during his first year of office.

Initial steps have been taken to ascertain the support likely to be forthcoming if Sub-Sections are formed and it is proposed to hold meetings during the next session in Essex and Kent, where there is a membership of 135 (including 41 Graduates) and 55 (including 15 Graduates) respectively.

A lecture by Dr. Genders on "The Effective Use and Selection

of Materials" proved to be extremely interesting.

At the last meeting of the 1949/50 Session Mr. E. Desmond gave a lecture, "The Mass Production of a British Alarm Clock,"

effectively illustrated by means of a film.

Mr. Core's appeal for the Hazleton Memorial Library has so far resulted in 100 books donated by members or purchased from the Fund, and £20 still in hand for the purchase of further books. The Graduates have been consulted in the choice of books.

The Reading Sub-Section has now formed a Committee and elected Mr. F. V. Waller as Chairman.

New members elected to the Committee are Mr. R. E. Leakey, and Mr. W. D. Opher, and two of the retiring members, Mr. H. W. Bowen and Mr. R. Kirchner, have been re-elected. Since the election Mr. R. Hutcheson has been co-opted to the Committee.

The Lecture programme for 1950/51 is complete, and it is proposed to hold lectures in the Croydon district and at Brighton. A Section Dinner is to be held on 1st February, 1951.

At the Annual General Meeting of the Section, interesting discussions took place on methods of increasing support to lectures during the Session. Many useful suggestions were made.

Mr. R. L. Paice was elected Chairman for the second term, and Mr. N. Maskell was elected Vice-Chairman in place of Mr. J. R. Lowe, who has resigned owing to pressure of business. Mr. C. Cartledge was appointed Assistant Honorary Secretary.

MANCHESTER Two excellent papers were presented to the Section before the Session terminated. In March Mr. E. C. Gordon England read his paper entitled, "Valid Incentives" (Payment by Results Examined). This paper had already been heard by other Sections and reported in the Journal, and there was a good attendance.

In April Mr. Ryalls gave a paper, "Developments in Oxygen Cutting", in place of Mr. Doré who was unfortunately indisposed. Mr. Ryalls is obviously a master of his subject and again an excellent dispussion followed the leatures.

discussion followed the lecture.

Preceding the lecture in March, the Annual General Meeting was held, when Mr. A. Fraser, who has been a member for the past twenty years, was elected President of the Section for the 1950/51 Session. Mr. W. Symes had declined to sit for a second term of office. The remainder of the Committee were returned unopposed and unanimously. It is considered that the full effects of the Membership Campaign will not be shown until the next Session.

The Committee are giving consideration to the formation of various Working Groups. The Syllabus Sub-Committee are working hard to complete the programme for the 1950/51 session. The Social Sub-Committee are well advanced with arrangements for a Dinner Dance (with entertainments) to be held in October.

A number of excellent lectures have been given since the beginning of the 1949/50 Session, culminating with the Annual General Meeting. This also included a film on Gear Cutting which was greatly appreciated. During April an evening visit made to the works of Baker, Perkins, Ltd., proved

very interesting. The lecture programme has been arranged for the 1950/51 session and in December it is hoped to arrange a Social Evening or Dinner Dance.

N. EASTERN The Annual General Meeting was held in March and was followed by a paper entitled "The Handling of Tolerances" by Mr. W. York.

An interesting visit to "Rising Sun" Colliery, Wallsend, took

place in April.

A working party was recently formed to discuss "Material Handling" and "Measurement of Productivity" and has already met.

Since the inaugural meeting in February two further meetings have been held; in March Mr. E. C. Gordon England gave his paper, "Valid Incentives", and in April Mr. T. B. Worth spoke on "The Production Engineer—His Education and Training", both meetings being very well supported.

The Section Committee was formally elected at the March meeting. It was very fitting that Mr. F. V. Waller, M.I.Prod.E., Director and General Manager of Western Manufacturing Estate, Ltd., Reading, should be the first Chairman as it was largely due to his enthusiasm and hard work that the Reading Sub-Section was formed. Mr. Daniell has had to resign the position of Honorary Secretary, having left the district, and the new Hon. Secretary is Mr. J. D. Smith.

A visit to Morris Motors Ltd., Oxford, was made in May and as only a limited number could be accommodated it is hoped to arrange for another party to make a visit in the near future.

During the next Session, one lecture is to be held in Basingstoke,

one in Oxford and the remainder in Reading.

The April meeting was addressed by Mr. F. E. Maer and Mr. C. Dee on the subject of "Joint Consultation in Industry" and an interesting discussion followed.

Committee meetings during the year have been very well attended and a varied programme of lectures for the 1950/51 Session has

been arranged.

SHREWSBURY
After the Annual General Meeting in April, Mr. SUB-SECTION T.B. Worth in his lecture: "The Production Engineer—His Education and Training" gave a very comprehensive survey of this subject; this was followed by a most interesting discussion. In May Mr. C. M. P. Willcox gave an interesting lecture on "Air Operated Fixtures", which was well illustrated by lantern slides and by actual fixtures operated by compressed air. The last lecture of the Session, "Production on Capstan Lathes" was given in June by Mr. R. C. Fenton.

During the quarter the Committee have met on three occasions, the main business being applications for membership and the Lecture Programmes.

SOUTH AFRICA Mr. L. K. Brown and Mr. F. W. Zanker jointly presented a paper entitled "The Wimet Age" to the April Meeting.

In May a film evening was attended by members and guests, and in the same month members visited Consolidated Glass Works, Ltd., Germiston. At the June meeting Mr. H. Lovitt, delivered a paper entitled "Production of Batteries".

In April an excellent paper was given by Mr. T. G. Rose on "How the Money Moves in Business". A highly successful and instructive visit was arranged to Pirelli General Cable Works, Ltd., Southampton, in May.

The Section's programme for the coming Session is now complete, and an attractive and varied programme of monthly lectures has been arranged.

In March, Mr. A. D. Abbott presented a paper "Observations Overseas" in which he dealt with many of his experiences while visiting England and Switzerland. In April Mr. Walter Scott, F.C.A.A., F.I.C.A., F.C.I.S., presented a paper, "Costing as an Aid to Production" and later that month, a visit took place to the works of the Goodyear Tyre & Rubber Company. Mr. C. E. McLean, Member of the Institute of Australian Foundrymen, lectured on "Foundry Mechanisation" in May.

The Committee has actively publicised the membership campaign and a number of applications have been forwarded to Headquarters. In May, Mr. J. M. Steer returned from a business trip to the United Kingdom, where he visited Headquarters and a number of Local Sections.

Mr. J. Finlay, who received the M.B.E. in the recent Birthday Honours, has retired from the position of General Manager of the Small Arms Factory, Lithgow, and a dinner in his honour, held in June, was attended by many members of the Institution and representatives of Government Departments and private organisations.

WESTERN The 1949/50 Lecture Programme ended in April with a record attendance at an excellent lecture given by Mr. A. P. Young on "Foremanship", followed by a lively and interesting discussion. The interest in the various subjects included in the lecture programme is proved by the increasing attendances.

During May the Regional Conference on "Materials Handling" was attended by approximately 250 delegates, including members from other Sections and friends from kindred Institutions. Press and other comments were very gratifying.

Members of the Section acted as guides during a visit paid by the Wolverhampton Graduate Section to the Bristol Aeroplane Co., Ltd., in June.

The Annual Dinner and Dance has been arranged for October and the President, Major-General Appleyard, The Lord Mayor and Lady Mayoress, and the Sheriff and his Lady have all accepted invitations to be present.

The Section welcomes to its Committee Mr. E. F. Gilberthorpe,

Mr. C. J. Luby, Mr. C. C. Cornford and Mr. R. E. Mills.

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In addition Mr. Teasdale, although co-opted for service last year, has been officially elected a member for this year. The Committee has been considerably strengthened, and it is hoped there will be an increase of membership and activities in the coming Session.

WEST WALES SUB - SECTION

In March a lecture entitled "The Effective Use of Materials" was given by Dr. E. G. West, B.Sc., who dealt with the subject very largely from the point of view of light alloys.

The Session concluded with a lecture on "The Oil Industry and the Llandarcy Expansion Project", presented by Messrs. I. Cameon and P. F. Ellis. The fact that this subject is of both national importance and local interest was proved by the large attendance.

Judging by attendances at lectures given during the Session, especially those by local lecturers, it would appear that industry in this area is becoming greatly interested in the activities of the Institution, and with this end in view the Committee are endeavouring to arrange even more lectures from local resources.

The 1949/50 Lecture Programme ended in May when Mr. T. B. Worth gave his paper on "Assessment of Engineering Training", which was very well received. During the past quarter, interesting discussions have followed most lectures and attendances have been good.

At the Annual General Meeting, Mr. H. Tomlinson was elected Section President for the ensuing year and Mr. R. Beasley, Vice-President. Mr. A. T. Aiers who, as President for the past two years has been untiring in his efforts on behalf of the Section, remains a member of Committee but it is regretted that Mr. T. G. Bamford, who has served the Section so well for many years, has decided to resign.

An outing to Rotol Ltd. took place in July.

The winter programme for 1950/51 has now been completed. Committee meetings have been well attended and much work done on behalf of the Section, particularly in connection with the Membership Campaign.

The Wolverhampton Committee have again agreed to give a

prize value £2 2s. to each of the six local colleges where a course in Production Engineering is taken.

WOLVERHAMPTON
GRADUATE

Since the last report lecture meetings, Committee Meeting and Works Visits have continued and representatives from the Section have attended Wolverhampton Senior Section Committee meetings

and the Section Honorary Secretaries Conference.

"Spring Design—Manufacture and Heat Treatment" was the subject of a lecture given in April by Mr. E. R. Finnicome. In May, Dr. Mullings presented an instructive paper, "X-Ray of Castings"; the last lecture meeting of the Session was held in June, when Mr. L. V. Curley presented his paper, "The Effective Use of Materials", and Mr. M. A. G. Andrews gave a paper entitled, "The Effective Use of Materials in the Bolt and Nut Industry", illustrated by a sound film.

During the 1949/50 Session, Members of the Section made

several interesting visits to firms in the neighbourhood.

The Section's dance which was attended by both Graduate and senior members, was a success both socially and financially.

The Annual General Meeting was held on the 6th March, 1950. After the meeting Mr. H. Crompton read a paper entitled "Better Jigs and Tools", which was well received.

The Annual Dinner was held in April and among the guests were Major-Gen. K. C. Appleyard, C.B.E., and Mr. D. Kaberry, M.P.

for West Leeds.

A golf match was held in June against the Leeds Association of Engineers, and in July the Annual Competition for the golf "Trophy" took place at the Otley Golf Club.

YORKSHIRE GRADUATE

In March, the Committee members for the 1950/51 Session were elected. In May the Secretary attended the Hon. Secretaries Conference in Birmingham, and various suggestions concerning the inclusion in the Journal of a greater proportion of material with special appeal to junior members.

IMPORTANT In order that the Journal may be despatched on time, it is essential that copy should reach the Head Office of the Institution not later than 40 days prior to the date of issue, which is the first of each month.

ISSUE OF JOURNAL Owing to the fact that output has to be adjusted to meet requirements, and in order to avoid carrying heavy stocks, it has been decided that the Journal will only be issued to new Members from the date they join the Institution.

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F. H. PERKINS, B.Sc., M.I.Mech.E., M.I.Prod.E.



F. H. PERKINS, B.Sc., M.I Mech.E., M.I.Prod.E.

Mr. F. H. PERKINS, B.Sc., M.I.Mech.E., M.I.Prod.E.

Mr. F. H. Perkins, Chief Education Officer of Imperial Chemical Industries Limited, and Chairman of the Institution's Education Committee, 1947 to 1950, is a man of exceptional prominence in the field of education and training in industry. His combined industrial and educational experience, in this country and abroad, have earned for him a reputation as an outstanding authority on industrial training activities.

Born in London, in 1904, and educated at Christ's Hospital, Horsham, Mr. Perkins was apprenticed at the L.M.S. Railway Works at Derby. During this time he was a part-time student at Derby Technical College, and gained a B.Sc. degree at London

University, with first class honours.

On completing his apprenticeship in 1927, Mr. Perkins spent two years as a Technical Assistant at the L.M.S.R. Carriage and Wagon Works at Derby, and among other activities he was given special responsibilities in reorganising the layout for the recondition-

ing of rolling stock.

In 1929, he joined Heiniks Erben and Company, Mechanical Engineers, with factories in Czecho-Slovakia, Germany, and Poland, where he remained as Foundry Manager and as Personal Assistant to the Managing Director until 1937. On returning to the United Kingdom, Mr. Perkins spent two years as Lecturer in Mechanical Engineering at Birmingham Central Technical College, and in 1939 became Head of the Engineering Production Department of

Northampton Polytechnic, London.

In 1941, he was appointed H.M. Inspector (Technical) at the Ministry of Education, and was subsequently seconded to the Ministry of Labour and National Service, in order to study wartime training methods in American industry. During this time with the Ministry of Labour, Mr. Perkins was responsible for the introduction of Training Within Industry (T.W.I.) Scheme for Supervisors throughout a wide variety of industries in this country. He also served on the Urwick Committee on "Education for Management".

In 1946, he was appointed to his present position as Chief Education Officer, Imperial Chemical Industries Limited.

Among other activities in the sphere of technical education and industrial training, Mr. Perkins, in 1949, acted as Adviser to the Director General of the International Labour Office, Geneva, on Supervisory Training. He is a member of the F.B.I. and B.I.M. Education Committees, and until recently was Chairman of the London and South East T.W.I. Association. He also has been Chairman of the Joint Committee for Higher National Certificates in Production Engineering.

EDUCATION COMMITT

The Committee meets regularly once a month in Birmingham with Mr. Knight of the Headquarters Staff acting as Secretary. A brief reference should be made to the loyal and conscientious service of its Secretary and of all its members, some of whom have served the Committee for a very long time.

Mr. W. E. Park, B.Sc. (Eng.), M.I.Mech.E., A.F.R.Ae.S., F.I.I.A., Vice-Chairman of the Committee, is the Education Officer of Vauxhall Motors, Limited. He has a distinguished record in technical education, and was latterly Principal of Luton Technical College for a period of over 10 years.

Other Members of the Education Committee are :-

Mr. F. Bloor, A.M.I.Mech.E., who had many years of industrial experience before he became a Lecturer in Production Engineering. He is now in charge of Production Engineering Studies at the

Leicester College of Technology.

Dr. W. A. J. Chapman, M.Sc. (Eng)., M.I. Mech. E., A.I.I.A., is Principal of the new Technical College at present under construction at Hatfield. He is well known in this country for his continuous interest in the development of the teaching of Production Engineering in Technical Colleges and he has been the author of some of the most useful text books now in use. He has been President of the Wolverhampton Section, a Member of Council, and has played a large part in developing the Institution's education policy.

Mr. F. W. Cranmer's considerable industrial experience has been devoted to the service of the Institution for over seventeen years in his Section, on Council, and on the Membership and Education Committees. He is one of the Committee's most regular attenders.

Mr. B. H. Dyson, F.I.I.A. His position and experience as Works Manager of Hoover Limited, and as a Director of Hoover (Washing Machines) Limited, has proved invaluable not only to the Education Committee but also to the Awards Sub-Committee, of which he is Chairman. He has lectured on Production Engineering and Management Subjects at a number of colleges in the London area.

Mr. E. P. Edwards has given over twenty years' service to the Institution. He is a Member of Council, and a member of both the Birmingham Section Committee and the Membership Committee (of which he is Chairman), in addition to the Education Committee. His long service, his practical guidance and his wide experience in industry have established him as a vital member.

Mr. J. F. Gibbons, A.M.I.Mech.E., M.I.I.A., A.I.Mar.E., is Managing Director of the Dalton Engineering Company (Blyth) Limited. He has given many years of service to the Institution and his varied experience has contributed much to the Committee work. Professor T. U. Matthew, Ph.D., M.Sc., A.R.T.C., Wh.Sch., M.I.Mech.E., M.I.Chem.E., M.S.A.I.E., became the first Lucas Professor in Principles of Engineering Production at Birmingham University in January, 1948. He serves as a member of the Education and Research Committees and of the Awards Sub-Committee and his counsel, born of a wide individual experience in this country and abroad, is always highly valued.

Mr. T. B. Worth, M.I.Mech.É., A.M.I.E.E., became the Institution's Education Officer in February, 1948. He has since implemented its educational programme by personal visits to all parts of the country. Much of the progress which has been made

during the past two years is due entirely to his efforts.

Mr. G. E. Knight, Head of Education and Membership Departments, and Secretary to the Committee, joined the staff of the Institution in June, 1946. His hard work, enthusiasm, and administrative ability have been largely responsible for the effective and progressive manner in which the Committee's policy has been carried out.

EDUCATION AND TRAINING

The education and training of the Production Engineer is a matter of first-rate importance to this Institution, to industry generally, and to the manufacturing economy of the country. It is essential that the Institution should be able to state a clearly defined policy in this matter, which? must govern in some measure the conditions of membership and also enable the members of the Institution to exert a strong influence in its application both in industry and in regard to the educational facilities that are required.

The main objectives of such a policy must be to promote an evergrowing stream of qualified engineers who, by virtue of their personal qualities and the character of their training, are fitted to fill the vital positions in the control of production in a wide range of industrial activity. The Institution's policy must also be framed to foster any activity that enables those already qualified and engaged in positions of production responsibility to keep

abreast of modern developments.

Much has been done by the Institution in recent years to promote production engineering developments in the educational sphere. Much more requires to be done. However, it can be said that as a result of these and other endeavours an increasing importance is now attached in this country to a more widespread study of production subjects in a scientific and analytical manner. Although sound practical experience will always form the basis of the training of the Production Engineer, considerable progress can now be recorded in the development of professional ability by the systematic study of subjects pertinent to production organisation and processes.

The Institution recognises the need for a broad approach in the matter of recruitment; some men are required with University background, while the great majority will, no doubt, enter industry shortly after leaving school and will pursue their studies of basic science and technology in the courses provided by the local

Technical Colleges.

The Institution's education policy must be kept sufficiently flexible to enable the right guidance to be given, whatever the channel of approach may be. Naturally such guidance must be in accordance with an individual's own aptitudes and abilities, but it must also recognise that industry today not only requires outstanding professional technical ability, but also those innate qualities that are necessary for the successful leadership of men. This applies particularly to those who seek a career in production engineering.

Whatever the character of the industrial activity the Production Engineer must be primarily a man who possesses:—

- (a) An ability to plan a programme of action,
- (b) an ability to discuss and explain such a programme to those whose co-operation will be required in carrying it out,
- (c) driving power, ingenuity and strategy needed in translating the plan into action.

Any industrial occupation that makes these demands should prove attractive to the most promising young men entering industry today.

In view of the importance attached by the Institution to sound basic training, premature specialisation as in other engineering professions is naturally deprecated, but there should be no doubt that the production subjects which normally form the curriculum in the later years of the training period are any less exacting in their demands on the intellectual and mental abilities of the student than the recognised subjects of any other engineering curriculum. One has only to scrutinise a good examination paper in Jig and Tool Design, for instance, to be fully convinced on this particular point. The tragedy of the present situation is that an insufficient number of engineers capable of conducting such courses and setting such examinations are forthcoming for teaching purposes. So long as this situation exists, the Institution must use every means within its power to extend and raise the standard of this teaching activity.

Although emphasis in the past has been placed on training for the engineering industry, the Institution is fully alive to the needs of those who will and do carry production responsibilities in all forms of manufacturing activities. Its education policy is so framed to promote training facilities for the widest range of

production activities.

The articles in this edition of the Journal deal exclusively with matters related to the Institution's education and training policy. Mr. Park's article puts the spotlight on the more outstanding educational and training activities of the Institution at the present time. Mr. Dyson gives sound advice to all young men who may wish to pursue a career in the production field. Mr. Worth explains the ways and means by which the study of production subjects may be pursued, and Dr. Schofield deals with some of the problems that confront the country today in planning for the future development of educational facilities in the realms of higher technology.

All members of the Institution are in a position to further in one way or another the Institution's interests in these matters, and a careful study of the following articles will provide a basis for sound

judgement and a guide to appropriate action.

F. H. PERKINS.

SOME OF THE INSTITUTION'S CURRENT EDUCATIONAL ACTIVITIES

By W. E. PARK, B.Sc.(Eng.), M.I.Mech.E., A.F.R.Ae.S., M.I.Prod.E., F.I.I.A.*

The following will give readers some idea of the education activities with which the Institution has been directly concerned during the past few years, and also an indication of its present plans for development.

1. Education Officer—Mr. T. B. Worth, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E.

The most outstanding feature has been the appointment of the Institution's Education Officer-Mr. T. B. Worth-who contributes the article in this Journal on "Studies in Production Engineering." Since Mr. Worth relinquished his position as Head of the Production Engineering Section, Birmingham Central Technical College, to take up his appointment as the Institution's Education Officer he has made a large number of personal contacts with Technical Colleges and industrial concerns. He is a great believer in discussing problems on the spot and anybody who has sought the assistance of the Institution on educational matters has received prompt and expert assistance from him. Through his combined industrial and teaching experience and his widespread contacts he now possesses an unrivalled knowledge of the present technical education facilities in the sphere of production engineering. As a member of the Institution's Education Committee he is fully conversant with the current trends in the Institution's policy. It is only as a result of the valuable assistance rendered by Mr. Worth that the Institution is now in a more favourable position in undertaking a number of the activities mentioned below.

2. Higher National Certificates in Production Engineering

In conjunction with the Institution of Mechanical Engineers and the Ministry of Education this Institution took a leading part in 1942 in the introduction of this Higher National Certificate Scheme for students in Technical Colleges. Numbers of students taking the course have grown steadily since that time, and 476 students entered for the examination in 1949. This number is still not large enough and even more effort is required to-day in order not only to extend the number of Colleges providing this course, but to ensure that its merits are placed fairly and squarely before all engineering students, at the time when decisions are taken regarding the selection of courses.

^{*}Education Officer, Vauxhall Motors, Ltd.

LIST OF ESTABLISHMENTS CONDUCTING HIGHER NATIONAL CERTIFICATE IN PRODUCTION ENGINEERING COURSES

ENGLAND and WALES:-

ACTON Technical College.

BIRMINGHAM Central Technical College.

BRIGHTON Municipal Technical College.

CHELTENHAM, The North Gloucestershire Technical College.

COVENTRY Municipal Technical College.

CROYDON Polytechnic.

DERBY Technical College.

ENFIELD Technical College.

GILLINGHAM, Medway Technical College.

KEIGHLEY Technical College.

KINGSTON-UPON-THAMES Technical College.

Leicester College of Technology and Arts.

LINCOLN Technical College.

LONDON, The Borough Polytechnic, Southwark.

LONDON, Northampton Polytechnic, Finsbury.

LONDON, L.C.C. Wandsworth Technical Colleg :.

Loughborough College.

Manchester Municipal College of Technology.

OXFORD Schools of Technology, Art and Commerce.

ROYAL Aircraft Establishment Technical College, Farnborough.

Rugby College of Technology and Arts.

SMETHWICK, Chance Technical College.

Southampton, University College.

STOKE-ON-TRENT, North Staffordshire Technical College.

TWICKENHAM Technical College.

Wednesbury County Technical College.

WILLESDEN Technical College.

WOLVERHAMPTON & STAFFORDSHIRE Technical College.

SCOTLAND:-

EDINBURGH, Heriot-Watt College.

GLASGOW, West of Scotland Committee on Technology.

These additional Colleges are considering the establishment of courses for the Higher National Certificate in Production Engineering:

> Belfast, Municipal College of Technology. Bradford Technical College. Bristol College of Technology. CARDIFF Technical College. CHELMSFORD, Mid-Essex Technical College. DARLINGTON Technical College. GAINSBOROUGH County Technical College. GATESHEAD Technical College. IPSWICH School of Technology. LEEDS College of Technology. LUTON Technical College. PRESTON. Harris Institute. ROTHERHAM College of Technology. SALFORD, Royal Technical College. South East London Technical College. South East Essex Technical College. STOCKPORT College for Further Education. WOOLWICH Polytechnic.

3. More Advanced Studies in Production Engineering

More attention is now being directed to the promotion of post-graduate and post-certificate courses, both in the Universities and in the Technical Colleges. Such courses may be of a long-term character, extending over a period of twelve months or more, or they may be short term, designed to deal with a specific subject or to meet a particular local need. The function of the Institution is to spot the need, to promote the provision of facilities wherever they may be most appropriately located, and, if required, to render, through its members the necessary lecturing and teaching assistance.

The provision of courses in Work Study, embracing a treatment of process, method, motion, time study and incentives, is a particular case in point. Industry has found that there is a serious dearth of facilities in this country for more advanced courses in this subject, and certain individual companies have been compelled to find the solution for themselves. Clearly it is the function and duty of the Institution to give a lead in this matter and to promote the development of courses that should become a permanent feature of the technical educational provision in this country. The reports of the Anglo-American Productivity teams have lent added emphasis to the need for this particular development.

4. Schofield Travel Scholarships

The arguments supporting the idea for the study of production methods in other countries need no emphasis for the readers of this Journal. While recognising the value of the reports of nationally organised visiting missions to other countries, the Institution remains convinced that one of the most practical and effective ways of translating the lessons to be learned elsewhere into our own industrial setting would be to select, very carefully, outstanding young men who already possess sound industrial experience, and to arrange for their acceptance into industry in foreign countries. During the past year, following the introduction of the most carefully organised selection procedure, which incidentally has been accorded widespread interest, two Graduates of the Institution have been placed for a period of six months on the shop floor in American industry. It is intended that their experience shall be made available to a widespread section of the industrial community in this country by lectures and discussions in forthcoming Section meetings of the Institution.

It is proposed that such Scholarships shall be awarded annually and that they shall be tenable in different countries where a study of production techniques is likely to be of interest and value to us. The Institution is spending a considerable amount of its own income on this particular project and it was considered appropriate that as the Scholarship was introduced during the Presidency of Dr. Schofield it should be linked with his name.

5. Summer School in Production Engineering

The year 1950 will see the inauguration of the first Summer School in Production Engineering, to be held at St. Peter's Hall, Oxford, from 30th August to 3rd September, 1950. Although certain aspects relating to the teaching of Production Engineering have been included in some earlier Engineering Summer Schools, the Education Committee is convinced that a more determined effort should be made to aid those who have the responsibility of organising production courses, and teaching these subjects in the various Colleges of the country. Attendance at this Summer School is not confined to those who carry these particular responsibilities, and others in industry interested in this work who may have a contribution to make are invited to co-operate so far as vacancies allow.

The Institution is promoting other residential courses, particularly those for its younger members, from time to time. The success of the week-end conference organised by the Birmingham Graduate Section, at Birmingham University, in September, 1949, provides a good illustration of the form which this activity should take, and it is hoped that other Graduate Sections will be prompted to follow Birmingham's example whenever a suitable opportunity occurs.

6. The Teaching of Production Subjects

One of the important keys to the whole development of courses in Production Engineering is the availability of highly qualified lecturers and teachers. The closest co-operation is maintained with Local Education Authorities and Principals of Technical Colleges, so that members of the Institution may be prompted to render teaching assistance wherever this may be required. Teaching is a profession, and it has to be remembered that those with the highest technical qualifications are not necessarily good teachers. Those willing to help in this way must be prepared, from time to time, to take short courses in "teaching method" and the Institution is willing to help in any courses organised for this purpose which may be particularly related to production subjects. The Regional Advisory Council for London and the Home Counties has recently decided to organise a special course in "teaching method," in which the Institution will take an active part.

One of the most useful aids to the teacher is a good text book. Good text books in Production Engineering are comparatively few. Frequent use is made of publications of other countries where the need is more adequately met, and many of these books are not entirely satisfactory for our own courses. The Institution maintains close association with the technical press and publishers, and members who feel that they can contribute through their specialist knowledge are assured of all possible help and encouragement.

7. Education and Research

The Institution recognises that Production Engineering research facilities, whether in the Universities, Technical Colleges or Research Associations, can be used to provide not only a valuable stimulus to the teaching of Production Engineering subjects, but also an excellent training ground for a certain number of younger members of the Institution who, in the years to come, will be expected to explore the boundaries of knowledge in any one specific direction. The Institution has welcomed the development of Post-Graduate facilities at Birmingham University and wishes to do everything within its power, not only to assist in the development at Birmingham, but also to promote similar opportunities in other parts of the country.

8. Practical Training

The extent and character of the practical training that is required by those seeking qualification as corporate members of the Institution has recently been the subject of careful study. Clearly any definition must be related to the form of academic training undertaken and requirements will vary accordingly. The case of the apprentice straight from school is distinct from that of the university man. The Institution, however, has always demanded some form of sound practical basic training and it has stated its general ideas on this matter in the pamphlet entitled "Practical Training for Production Engineering." This may be subject to some modification in the light of further experience, but it represents at the present time the considered opinion of the Education Committee.

9. Associate Membership Examination

As readers will know, the Institution introduces in 1950-51 its Associate Membership Examination. The preparation of the examination structure, and the laying out of syllabuses has meant careful study by the members of the Education Committee. The requirements of the examination take full cognisance of the existing examination structure in the colleges, and a scheme of appropriate exemptions has been developed.

It must be made quite clear, however, that with the introduction of this examination, evidence of knowledge and ability in certain subjects specifically aligned to the field of production engineering will be required, and that there are no easy exemptions for those who have successfully pursued purely mechanical and electrical

engineering courses.

THE PRODUCTION ENGINEER'S OPPORTUNITY IN INDUSTRY

By B. H. DYSON, M.I. Prod. E., F.I.I.A.*

The subject of "The Production Engineer's Opportunity in Industry "can be considered under the following headings :-

- (1) The National Problem and the Scope of Production Engineering.
- (2) Industry's responsibility in the training of Production Engineers.
- (3) What Management expects of the young Production Engineer.
- (4) How the young Production Engineer should prepare himself for promotion.

NATIONAL PROBLEM AND SCOPE OF PRODUCTION ENGINEERING

One of the most disturbing elements which exists in relation to national prosperity today is the acceptance of lower standards of expectancy. Individuals are too willing to think that conditions are against them. They are pleased to think it is the other fellow who must do something; the technician is inclined to think it is all Management's job.

On the question of national standards, it is impossible to talk about a higher standard of living and at the same time introduce a

lower standard of expectancy.

Many readers will remember the recent Olympic Games. The standard of expectancy for the various events was surely set by the previous Olympic and World records. The standard of expectancy in air speeds has been set by the recent achievements of British pilots in British aircraft.

In other words, it is the INDIVIDUAL who sets out to achieve something higher and better than that previously attained, and

thereby creates a target for others.

Consider the standards of expectancy of surface finish and dimensional accuracy. Not long ago working to .001" was considered to be the acme of perfection, but now Production Engineers

talk of working to .0001" as common practice.

The standard of expectancy for British industry is not set by American experts or by Government departments, with their posters which say: "Ten per cent. more production." It is the responsibility of individuals, as industrialists and as Production

^{*} Works Manager, Hoover Ltd. Director, Hoover (Washing Machines) Ltd.

Engineers; but with no goal post there can be no goals, with no winning post there can be no race; with no standards of expectancy for the individuals and departments in an organisation, there can be no measurable efficiency.

A nationally stated target of ten per cent. more—or any other wide statement—means nothing to Joe who operates the capstan, or Bill who jigbores the fixture, or to George who issues the raw

materials, or to Mary who keeps the stock records.

Organisations are in many respects like individuals. One resemblance is their sensitivity and reaction to environment. Often persons of considerable potential capacity tend to deteriorate when conditions and circumstances are such that there is no challenge to put forward their best. Under the shelter of full order books, assured profits and a Seller's Market, many organisations have lacked the standard of expectancy that stiff competition sets.

It is obvious, therefore, that in order to face fiercely competitive trade it is vitally necessary that the men who will be heading up British industry—in other words, young Production Engineers are fitting themselves through education, training and experience

for the full scope it will offer.

The greatest future for research, initiative, advancement and progress in the next decade lies in the productive side of industry. This implies not simply the production processes but all the operations involved—from the receipt of the customer's order to the despatch of the finished goods.

Responsibility Must be Accepted.

Having appreciated that often only 50 to 60 per cent. of the people in industry are directly employed on production, and that direct labour costs are often only 20 to 40 per cent. of the total costs, it would appear that Production Engineers must accept the responsibility of engineering production—of much more than just machining and assembly operations.

There are many important services whose only effective function

is to assist production effort.

For this reason, when Tool Designers are handed a component to tool up they should be told the cost which the company is prepared to face, and the operating time required for the completion of their part of the job. It is doubtful, for example if Tool Designers and Tool Makers always know the comparative times of locating a blank in a forming tool; or the locating, loading, swarf cleaning and unloading times of the various types of jigs and fixtures. Jigs and fixtures are not designed frequently enough to synchronise the use of both hands and to incorporate a blind approach location for both component and fixture.

of workpeople who are not willing to operate more than one machine, but are machines always positioned in order that this is a proposition? Do Production Engineers always take every opportunity to design fixtures and machines for twin—or multi—

machine operation?

The same ideas might be expressed about the engineering of material handling, not only in the production departments, but in the Goods Receiving section, the Stores, Plant Department, and Tool Room. So often skilled toolmakers and plant engineer's men handle heavy tools and machines with blocks of wood, pipes and crowbars, yet the recent Mechanical Handling Exhibition showed that first-class labour-saving equipment is available. Even in modern factories, maintenance engineers, electricians and carpenters use hand scrapers, hack saws, hammers and chisels, jack planes, hand drills and paint brushes. Yet efficient portable power tools have been available for years.

Again, the Inspector is frequently left to his own resources by the fact that Managers neglect to define the inspection operations on their process operation layout. So many Production Engineers do not accept it as their job to engineer inspection functions, yet surely if quality is the hall mark of British products, to ignore the work place and equipment of the Inspector is only paying lip

service to quality.

Again, process layouts should not only state the width and thickness of materials, but also the economic length and quantities in which it is required. As a simple example, a certain blanking job in a power press proved that material ordered in six-foot lengths resulted in an output of 620 blanks per hour; in twelve-foot lengths output was 930 blanks per hour, but when coiled strip

was specified, output rose to 1,730 blanks per hour.

Similar views might be expressed in regard to the methods of Progress Control. Far too much time is spent recording on paper the results of work in progress, instead of doing something about it while it is actually happening. Visual control is the only real control; and that is why the layout of the office and factory floor is one of the most important factors in ensuring economic production. Office and factory floors must be planned and laid out to facilitate control. The Supervisor must be able to stand in his department and actually see what is happening.

The Production Engineer's job in relation to national prosperity is to accept the responsibility of engineering the production of every function involved from the receipt of the customer's order

to the delivery of the goods.

For industrial prosperity and national well-being, it is essential, too, that the ablest men should be secured for the higher management in production. The chief executive control affecting productive efficiency will rest on their decision, judgment, energy and

capacity.

It is important to recruit the best man, and this means selection from all walks of life, all branches of business, to find men who can engineer production. Production Directors and Managers do not inherit high industrial positions—there are innumerable examples of leading industrialists who have risen from the humblest of beginnings who, by virtue of their qualities alone, have come to the top.

There is no shortage of young men with good ideas, but there is a great difficulty in getting young fellows who can make an idea work and produce results—some one else's ideas as well as

their own.

In fact, some recent figures published show that both in America and in the British Armed Forces during the War, 10 per cent. of young engineers could put forward first-class ideas, but only

3 per cent. could produce results from ideas.

Directors and Managers in such industries as glassware, potteries, textiles, clothing, mining and even in breweries, frequently say: "I am looking for a first-class Production Engineer." But how many young Production Engineers are in the 10 per cent. class, and more important still, how many are in the 3 per cent. category?

INDUSTRY'S RESPONSIBILITY FOR TRAINING PRODUCTION ENGINEERS

One of the problems affecting our national economy is lack of leadership, and another, the narrow view taken of the application of Production Engineering. These are

industry's problems in relation to national economy.

The majority of people are led into action—in fact, people like a leader and will respect and follow good leadership. If the official leader fails, then an unofficial leader, whether he be the Personnel Manager, Shop Steward, or the noisy agitator, will soon influence the working group. Leadership has been defined as the art of being able to get people to express more ability in action than they are aware of having in reserve.

Managers generally have a great deal to learn about correct selection and training of leaders. Too often they have neglected the need for production training and are in danger of selecting men who lack the production knowledge and ability to understand

and ask the right questions in order to control effectively.

Selection for Promotion.

When considering promotions it is a wise policy to cast as wide a net as possible, and to promote and interchange supervision from department to department, in order to develop leadership qualities. It pays to take a chance with a promising young fellow, say, from the Cost Office, the Tool Drawing Office, or the Tool Room and

put him in charge of the Production Department. Surprisingly good material will be found from unexpected sources. Young men can only gain in experience if they are given the opportunity to accept

responsibility.

They must, of course, be given considerable training, including courses outside the company, such as the Administrative Staff College. In training ambitious men, it is important to ensure that they have a chance to develop and are not frustrated. In fact, just as it is necessary to cut out the dead wood and prune a tree before grafting on new wood, so it is necessary before introducing new leadership. This often demands considerable courage; it is therefore so often neglected.

If a man is required who can jump a six-foot obstacle, it is no good having one who can jump five feet and think that by getting another man who can jump three feet to help him, this will meet

the case.

Those on the lower rungs of the ladder in industry should know that they can rise as high as their merits deserve. If this were more widely realised, it would result in a tremendous surge forward, and bring new energy, added strength and quality to the ranks of

Production Engineering.

An unfortunate tradition has grown up that makes the question: "Well, how old is he?" the final one in turning down a young fellow who deserves promotion. So often Managers say: "What, young Smith, why, he's only a boy; he's too young—he must wait." This is, of course, the very thing that keeps Smith young in experience until he is old in years.

Management's responsibility is to publicise promotions widely and to adopt the policy of promoting from within whenever this

is possible.

One of the great failings in industry is lack of courage in calling in a young fellow and discussing with him his mistakes and the error of his ways. It is surprising how much some young fellows appreciate and above all react to, the opportunity of discussing their shortcomings, even personal ones such as appearance, approach and discipline.

In fact, it is a managerial responsibility to develop good human products as well as good material products. If there are no good and upcoming young men in an organisation who are available

for promotion, then there is mismanagement.

It is useless to complain that the young fellow has insufficient experience to accept responsibility and continue to give him no opportunity to gain this experience. There is nothing like the heat of the battle-field for bringing out the best in a man, and many factory floors have their battles.

A young fellow should never be left just to trail round with a

craftsmen or supervisor and be expected to gain experience. He should be given a job of work, a definite assignment. He will make mistakes, but that is how most good managers learned to analyse the reason and not to repeat the same mistake.

Furthermore the young fellow should be sent outside the factory to negotiate a new process, to inspect a machine tool which the management contemplates purchasing; perhaps even to deal with a difficult customer. He could be sent abroad, even if it is only to the Continent, but always with a job to accomplish. Lads up to twenty years of age should be sent in small groups, but over this age, they can travel as individuals.

Industry also has a responsibility to show active interest in the local Technical Colleges by offering facilities both at the factory and at the College. A recent survey by the Institution indicated a certain amount of neglect in this inter-industry and Technical College interest and activity. The same survey also illustrated a certain lack of interest on the part of industry in relation to the professional institutions. It is no use industrial management complaining that they cannot get good Production Engineers and at the same time not even acquainting themselves with, or giving assistance in, the development of the Institution.

WHAT MANAGEMENT EXPECTS

Possibly what management expects first and foremost is the ability to get things done, to make ideas work, to get results, to arrive at a conclusion, and to make a definite decision in a reasonable time and at reasonable cost. Many young men fail because they allow their own bright ideas to blind them into a state where they can only see why someone else's idea won't work. Management wants men who can be receptive, not just defensive.

Management expects a man to prepare himself for promotion, not to wait for it to come along and then to do something about it. Management is often confronted with the young man who wants an executive or managerial job, yet who knows very little about the job he expects to manage.

In the majority of cases, men are not just promoted—they promote themselves by demonstrating through actual results their ability and competence.

It is of interest to note some of the qualifications that were listed in selecting men in the recent Schofield Travel Scholarship competition. Employers were asked to assess candidates from their firms under the following headings:—

- (a) Technical ability.
- (b) Ability as a leader.
- (c) Attitude towards job.
- (d) Previous work in the project to be studied.

The first three of these qualities are those which an executive looks for in his potential managers. It is therefore interesting to note that although all candidates were recommended by their employers, and could therefore be assumed to be above average, ability as a leader was the quality in which the lowest marks were scored.

At another stage of the assessment for the Scholarship Awards, the Selection Committee were surprised to learn that many of the candidates had never availed themselves of opportunities presented to them of visiting other works in this country, yet considered themselves qualified to visit American factories.

PREPARING FOR PROMOTION

Often apprentices do not appreciate the value of their indentures—they are in effect priceless; they cannot be bought, and no matter what happens they cannot be taken away. They are a passport to success; every apprentice has a Works Manager's baton in his tool kit—his job is to prepare himself in order to be worthy of using it.

In my own company there are thirteen directors who are fulltime executive directors—and who have all risen from the ranks. Five of these directors started as engineering apprentices and rose

through the ranks of production engineering.

Business today is largely managed by the apprentices of yesterday; business of tomorrow will be managed by the apprentices of today, and a British Apprenticeship Indenture is honoured and accepted as the hall mark of skill and craftsmanship. The ingenuity, inventiveness, skill, adaptability and craftsmanship of British engineers is acknowledged with world-wide acceptance. Young Production Engineers have indeed every reason to be proud of the tradition they inherit.

Finding the Answers.

At a later stage in an engineer's industrial life he will be expected to know the answers to a good many of the problems, but in his early years he is expected to ask questions. Young engineers should set themselves the standard of finding the answer to at least one industrial problem each day. Libraries and technical journals are available to him—generally free of cost—he should question himself when he turns to the last page: "What have I learned?" and: "Can I put into practice on my actual job something I have learned from the technical journal I have read?" He should not be satisfied with just a quiet read and a smoke.

When he visits another department, factory or exhibition, the young Production Engineer should set himself the target of finding at least one thing that he can apply to his own job, or can recommend to his Supervisor for application to his department or factory.

Otherwise these visits are just another outing.

Social contacts, sport and recreation are important. In fact, to know one's fellow men, to be able to converse on a variety of subjects, and to maintain a healthy body and mind is the only foundation on which to build industrial progress. Finally, the following points should be borne in mind by the young Production Engineer:—

Self Reliance.—One of the best ways of learning to be self-reliant is to live away from home, in lodgings, even if it means doing this

sometimes in one's own town.

For at least some part of the early years of experience it is a good thing to earn one's living away from home; best of all, in another country. I still rank as my finest experience and training the time when I arrived in Chicago at 21 years of age with £5

in my pocket and a lot of big ideas.

The young engineer should be ready to change his job as soon as he is convinced he is not getting anywhere—he should not scan the "Positions Vacant" advertisements only, he should pick out the type of company he wants to work for and go all out to get a job there; even if it means starting at what appears an initial lower salary.

Respect.—A leader must win respect—there is a lot of difference in being liked and being respected. He cannot please everyone all the time, but he can be respected by everyone all the time.

Timing.—Timing is very important; doing the right thing at the wrong time is often disastrous. See that actions are rightly timed. Mr. Churchill's speeches are a masterpiece of timing.

Observation.—The young engineer should always be observant—he should train himself to see all that is going on. Even when walking from one department to another, from one person to another, he should develop the power of observation and he will learn a lot. He should never become a creature of habit. If he always goes the same way to lunch, or to the cloakroom, he limits the scope of observation.

Expression.—The powers of explanation and expression are important in a Supervisor—they are a personal example to the team.

(a) Always look at a person when telling him something, particularly if it is a matter of correction—look at the person's eyes in order that he is aware that the approach is specific and personal.

(b) Always use simple, easy terms, never try to impress by complicating an issue. Deal and finish with one problem at a time—

never shout to impress.

(c) When talking to a group of people, try to make everyone feel you are talking to him—change the line of vision. If a little nervous, keep the hands out of the way—they always betray nervousness.

Courage.—A person who accepts responsibility and authority must never be afraid to make a decision and act on it.

(a) Courage is required to talk to people about their faults.

(b) Be ready to challenge immediately a person using wrong methods or working inefficiently.

(c) Come straight to the point with a distasteful subject, and then soften the blow. Never "cover up" by elaborating the fiction and skimping the fact.

(d) Never be afraid of the truth, however distasteful.

(e) Never let disappointment numb enthusiasm—one must train oneself to react in the right way to disappointment. To be able to stomach disappointment and take it as a challenge is perhaps

the greatest test of courage.

I always remember the answer given to me by a General Manager of the American Ford Organisation when I asked him how he got the keen 28-year-old Works Manager who was in complete charge of the Ford plants I was visiting. He said: "We demonstrate and preach all we know, and we keep on repeating it, and the day the young engineer starts to do it back to us, we know he has got what it takes to be successful in industry."

STUDIES IN PRODUCTION ENGINEERING

By T. B. WORTH, M.I.Mech.E., A.M.I.E.E., M.I.Prod.E.*

Consideration of educational policy leads to questions concerning the character of studies in production engineering, and the provision made. These notes have been compiled to give practical definition to statements of policy as far as formal study is concerned.

The overall object is to encourage the development of men who, through training and experience, can make a scientific approach to the problems arising in the manufacture of commodities. Study must provide a knowledge of the principles necessary for the analysis of the problems and a knowledge of the techniques required for their satisfactory solution leading to the provision and co-ordination of the means of production.

CHARACTER OF STUDIES

The character of the studies becomes apparent from the nature of the problems which have human, technical, and economic aspects. To give added distinction, the provision of a mechanical aid for the making of an article involves design but its use in production processes involves consideration of the factors introduced by the people who are to use it. This demands the closest possible relation between the subjects studied in any course in production engineering.

SUBJECTS All courses in production engineering include, in varying degrees, the following groups of subjects.

1. Basic. (General and Scientific).

English Language, Industrial and Social History. Mathematics, Physics, Chemistry.

2. Scientific-applied to engineering.

Strength of Materials, Theory of Machines, Applied Mechanics, Applied Electricity, Metallurgy, Engineering Drawing and Graphics.

3. Technical—specific to engineering processes.

Foundry Processes, Welding Processes, Forging, Presswork, Sheet Metalwork, Machine Tools, Jig and Tool Design, Metrology, Engineering Plastics, Plant Layout and Materials Handling.

Semi-technical and Administrative (applicable to all manufacture).
 Work Study—process, method, motion, time, job evaluation, incentives and rate-fixing.

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Planning and control of production, Quality Control, Industrial organisation and administration, Costing and Estimating.

Development and Research.

Economics.

Other subjects may be introduced, but those quoted are common. By selective combination, they may be reduced to form curricula of practicable courses. The depth to which some of the subjects may be studied will depend upon the degree to which the basic sciences have been studied.

It is this factor which determines the different nature of the various courses. This is not the only factor, however, and the need for different kinds of approach can be illustrated by reference to industrial requirements.

Depending upon the problem, production research and development may demand a fairly deep scientific knowledge, whereas the provision and lay-out of a manufacturing unit may demand a comparable knowledge of processes, plant and personnel requirements. Although trends in equipment design are towards ease of control, it is increasing in complexity, and courses must embody sufficient basic studies to enable the relative value of new equipment to be appreciated with respect to the particular development under review. Let us not forget, however, that the ultimate test of a man's ability lies in the answer to the question: " How well can he do the job?" Education and training help, but they are not the whole story.

As well as giving information concerning the facilities **PROVISION** which exist for studies in production engineering, these notes show the considerable extent to which the Institution is indebted to Technical Colleges and Universities. Policy grants a high place to their encouragement and help in all possible ways. Where examples are given, it is to illustrate some particular characteristic, and in most cases, equally useful provision exists in a number of other directions.

STUDY IN TECHNICAL COLLEGES

As far as production engineering is concerned, facilities are available in a number of colleges for study leading to the award of Higher National Certificates which with Endorsements,

involve both engineering subjects and administration subjects. From the Technical Subjects specific to engineering, those most

commonly grouped together are :-Machine Tools, Metrology and Jig and Tool Design.

There is a need for other groups of subjects, and for courses which contain a study of Plant Lay-out and Materials Handling, most important subjects capable of wide application.

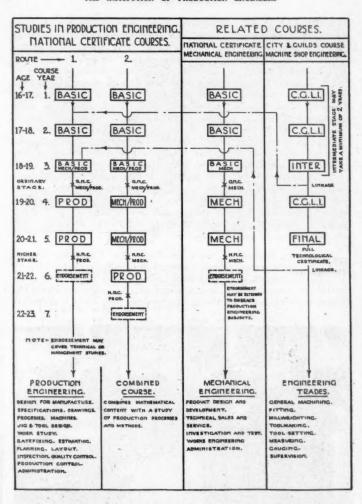


CHART The chart shows two forms of provision and related courses in technical colleges.

1. Route 1 is the normal avenue of qualification by Higher National Certificate in Production Engineering.

2. Route 2 shows a scheme whereby the provision of study of production engineering subjects in a normal mechanical engineering course may lead to a dual qualification. The character of such a course would be different from either of the "straight" courses.

The course does not therefore replace that shown in Route 1, but is a useful complement where both can be planned together. One of the essentials in the planning of production is a sound knowledge of the capabilities and capacities of plant, so some linkage has been established between the City and Guilds of London Institute course in Machine Shop Engineering, and the Higher National Certificate Course in Production Engineering.

3. The provision of endorsement affords considerable flexibility in the arrangement of further studies which are outlined later.

4. The types of industrial activity for which the various courses prepare are shown at the foot of the chart, but are not intended for rigid interpretation. They obviously neglect the all-important quality of personal characteristics and preference. Plates 1 and 2 illustrate study groups at Wandsworth Technical College which are typical of the courses described above.

Analysis of curricula shows that University Degree Courses, whether gained internally, or externally by study in a Technical College, offer opportunities for considerable study of the basic sciences with a tendency towards the design-research function, though technology may form a consider-



Courtesy of "Machine Shop Magazine".



Plate 2.

Courtesy of "Machine Shop Magazine"

able part of the course. It is interesting to note, however, that the Degree in Chemical Engineering awarded by the University of

London includes among other things a study of :— Chemical engineering operations.

Transport of Materials in Works, and generally.

Materials of Construction.

Plant design and construction.

Economics.

Setting out of Works.

These are true studies in production engineering as applied to the manufacture of chemical products.

FURTHER STUDIES Provision for further study exists in both Universities and Technical Colleges, at the post-graduate and post-certificate level.

The graduate course in Engineering Production and Management Principles, which is available on a one year full-time basis at the University of Birmingham, is a significant new development in the

field of specialised education for management.

The course leads to the award of a Diploma in the Principles of Engineering Production and Management and to Higher University Degrees. The subjects covered include:—

Principles of Engineering Production, Principles of Engineering Management, Work Study, Production Planning and Control, Statistical Methods, Industrial Measurement, Factory and Plant Lay-out,

and specialised lectures in Industrial Law, Industrial Relations,

Occupational Psychology and Cost Accounting.

Technical College provision for "further studies" is indicated by the Industrial Administration Course at the Central Technical College, Birmingham, and the course in Engineering Metrology at the College of Technology, Manchester.

Industrial Administration (Birmingham).

Factory Organisation,
Organisation of Industry,
Product Design and Development,
Work Study,
Factory Costing and Estimating.

Engineering Metrology (Manchester).

Subjects studied include:—
General Metrology,
Instrumentation,
Quality Control,
Machine Tools,
Limits and Dimensions,
Electronics,
Physical Optics.

Formal group courses do not satisfy all demands, and the provision of short-courses for the study of some special aspect of production is a valuable practice, and in some ways is related to the provision of lecture meetings by the Institution. Typical of such short-courses are:—

University of Liverpool: 1. "Operational Research in Industry."
2. "The Economic Background of Management Problems."
Acton Technical College: 4 weeks course on "Methods, Motion and

Time Study."

Croydon Polytechnic: "The Design of Simple, Compound, and Multi-stage Press Tools."

Wolverhampton and Staffordshire Technical College: "Fine Measurement and Precision Manufacture."

Birmingham Central Technical College: "Production by Welding."

University of Birmingham (Residential Summer Course): "Work

Study and Operational Research."

NATIONAL National Colleges make provision for full-time study in courses planned to meet the requirements of particular industries, and are responsible for the highest education in the technology of those industries.

Such courses may include considerable study of subjects related to manufacture, and to the planning and control of production.

These two examples serve to illustrate this :-

1. The College of Aeronautics-Cranfield.

Specialised but related departments cater for—Aerodynamics, Aircraft Design, Aircraft Economics and Production—Aircraft propulsion, and Flight.

The Department of Aircraft Economics and Production includes

in its curriculum these subjects :-

Production Processes. Industrial Statistics. Aircraft Operation Market Research. Production Design. Economics. Administration & Jig & Tool Design. Time Study. Planning, Estimating, Maintenance. Management. & Ratefixing. Inspection. Personnel Production Control. Metrology. Management.

2. The National Foundry College-Wolverhampton.

The National Foundry College is the successor to the British Foundry School which was opened in 1935. It provides a course of post-graduate type and standard leading to the award of a Diploma, and facilities for Post-Diploma study and training in research are provided.

The following outline of the examination requirements illustrates

the nature of the provision made :-

Foundry Metallurgy. Ferrous Project.
Foundry Technology. Non-Ferrous Project.
Foundry Management.

The projects section is intended to cultivate the knowledge of the art and science of founding, and involves the preparation of complete schemes of foundry production, and the planning or remodelling of a foundry to specified requirements.

Developments in Australia. (Indicative of studies abroad.)

In addition to the provision made by the Melbourne Technical College, an important new development has been fostered by the Sydney Technical College, New South Wales. Courses are provided at two levels—Certificate and Diploma.

The Certificate Course has been designed primarily as a basic course in Production Engineering with opportunity in the final year for specialised studies in particular fields, thus:—

STUDIES IN PRODUCTION ENGINEERING

Certificate Course (Engineering Industries).
Stage V subjects include:—
Production of—

Machine Shop Work. Press & Sheetmetal Work. Welded Work.

Forgings & Hot Stampings.

Castings.
Plastic Mouldings.
Production Control.
Motion & Time Study.

The Diploma Course aims at satisfying the need in Australia for production engineers with the highest technical qualifications, and demands different entry qualifications from those for the Certificate Courses. The course includes, among others, studies in these subjects:—

Production Technology (processes).
Production Design.
Production Engineering Laboratory.
Production Planning & Control
(includes Motion & Time Study).
Factory Organisation.



Plate 3. Coil Winding.



Plate 4. Tool Room.

Post Certificate and Post-Diploma Courses complete this comprehensive provision.

It should not be thought that the foregoing examples are the only ones. Parallel provision has been made in other establishments, and it would be an interesting piece of research to compile comprehensive references for the last ten years, during which much of this development has taken place.

All such study must be related to the science and practice of production engineering. To help such an appreciation to be made, the following illustrations have been chosen from the Training Brochure of Messrs. The Automatic Telephone and Electric Co., Ltd., of Liverpool, and permission to do this is sincerely appreciated. (The notes are the writer's.)

Plate 3: "Coil Winding."

Illustrating, Lay-out, Materials Handling, and gives some idea of the thought necessary to achieve smooth and orderly output.

Plate 4: " Tool Room."

Illustrating, the provision and use of Machine Tools for the manufacture of the tools of production.

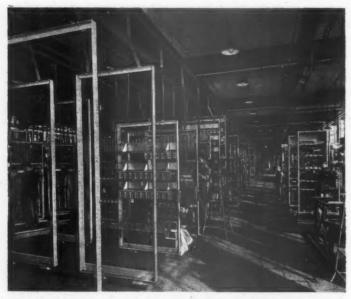


Plate 5. Automatic Equipment and Rack Assembly Room.

Plate 5: "Automatic Equipment and Rack Assembly Wiring." Illustrating lay-out planned for assembly.

A final note concerning the part of production engineering in the

general scheme of manufacture.

The field of production engineering is large, and although the production function has always been a field of activity demanding a distinctive approach, it is only comparatively recently that courses in that field have become well defined. The following extract is from "The Graduate in Industry" by Dr. P. Dunsheath, and well expresses the career aspect. (The author is considering the University Graduate, but the remarks are general).

"The phenomenal growth of the mass production of articles, in themselves complex and involving intricate design and workmanship, has opened up a new and important career demanding ability of the highest order, and a particular aptitude differing from that required of the engineer who specialises in design or research.

"Whereas costs enter into all aspects of engineering, they become an extremely vital factor in the lay-out of plant and the organising of personnel for the rapid conversion of raw materials into finished

· STUDIES IN PRODUCTION ENGINEERING

parts, or the assembly of such parts into a complete machine or instrument. A steady maintained output of an engineering or chemical product carried out in such a way that it can be distributed and sold at a profit includes much thinking beyond the original design of the article. In fact, it is not too much to say that, notwithstanding the most careful design, the highest possible performance and the most attractive appearance, an article required in large quantities cannot be made available to the community without great care being expended on the methods of production; all these things are important, but without the efforts of the production engineer they are useless."

This pattern of studies in production engineering will be a gradually changing pattern as developments in Higher Technological Education are pursued, but the essentials will remain, with the emphasis, as in all careers, on the individual and his attitude

towards his fellows and his work as a member of a team.

THE DEVELOPMENT OF HIGHER TECHNOLOGICAL EDUCATION

By Dr. H. Schofield, C.B.E., Ph.D.(Lond.)., B.Sc.Hons.(Lond.)., A.R.C.Sc.(Lond.)., D.I.C., A.M.I.C.E., M.I.Mech.E., A.M.I.E.E., M.I.Prod.E., M.I.Struct.E., F.Inst.P., F.I.I.A.*

In the early days of this century, Technical Colleges sprang up and the number of their staff, the capacity of their buildings, and the extent of their equipment depended far more on local patriotism than on any encouragement or assistance from the then Board of Education. It is true to say that in those early days the Board were just not interested in Technical Education; some of their principal officers knew nothing about it and few of them ever thought it worth while to visit a Technical College.

Since those beginnings two major wars have taken place. The first of these, and particularly the second, made demands upon Technical Colleges for training industrial personnel and for producing equipment which could never have been contemplated in earlier days, and they obtained results which simply amazed all

concerned.

Whilst the Technical Colleges were at first primarily concerned with part-time students attending only in the evening, some of the more enterprising began to formulate full-time day courses. The earliest of these were concerned with engineering and commerce, and concurrently with this development the modern Universities also began the development of Faculties of Technology; again primarily in the early days these were in Engineering. Thus there has been growth along two avenues, both having the same objective, but using a different method, and not only receiving very different treatment from the national purse, but being very differently placed by reason of the type of award available at the end of the course.

There is no question that in this country there is a strong tendency to regard a degree as a much-to-be-desired qualification, and by and large throughout industry and commerce, the student who can claim a degree qualification is more favourably placed than his colleague who has to offer in its place something different.

There are exceptions to this generalisation but the man without a University qualification has to advance by the harder road. He is, so to speak, judged on his merits, whereas the University man tends to be accepted on his paper credentials.

^{*}Principal of Loughborough College.

TWO SYSTEMS OF Now these two systems of higher education-HIGHER EDUCATION
Faculties of Technology in the Universities and full-time courses in Technical Colleges—have been developed reasonably concurrently and without doubt the work done in the major Technical Colleges is equal to anything that has been done under similar conditions in the Universities. In fact, a good many leading representatives of the Universities would agree that certain subjects or aspects of subjects could be, and often are, much better handled by the Technical College than by the University. Of such subjects Production Engineering is typical. There are many others—building, rubber technology, ceramics, and many sections of the textile industry are very much better taught and developed in the Technical College than in the University. The Technical College is more intimately connected with industry, more closely concerned with its problems and in many cities more directly helpful to industry by undertaking the kind of research that solves a particular problem than is the University, concerning itself with more basic research which, of course, ultimately, is of great service to the nation generally.

The big gap in education in this country, said Sir Lawrence Bragg opening a discussion on 'The Place of Technical Education in University Studies' at the conference of the Universities of Great Britain and Northern Ireland at the Senate House recently, was the lack of Technical Universities. The first claim on money afforded for higher education should go to independent institutes of technology, rather than to an expansion of the present University system.

Our position in Pure Science was high, but our higher technological education was on the whole deplorably low in standard. He doubted whether it could be effectively done by any institution which was under the direct tutelage of the Ministry of Education or the local Education Authorities. The institutions which gave higher technological training must have the status of dominions, not of colonies, in the educational world. The ideal, it seemed to him, was to build up new centres of University rank. He did not see why their courses should not be as broad as those in Universities, including Arts subjects, if it were felt right for a technologist to study them. They would award their own degrees. Their sole difference from Universities would be one of outlook. The men who taught in them should have been successful in the world of action, just as most teachers of physics and chemistry in the Universities ought to have shown themselves successful in pure research. He did not, however, want to see all technological education leave the Universities.

A paper from Sir Edward Appleton (Edinburgh) was read in his absence and drew some distinctions between University and Technical College education. The task of the Technical College was to produce engineers, that of the University to produce engineering scientists. The Technical College taught the 'how' of things, the Universities the 'why'. Sir Edward did not believe that the products of Universities should be ready-made for any special job in life; he did not want to see Universities cluttering themselves up with specialised technologies such as glass, rubber, brewing or textiles. As an experimentalist, he was all in favour of building one example here of an institution like the Massachusetts Institute of Technology, but our first duty was to improve what we had already—the University Schools of Applied Science.

This is the position as it is seen to-day. There are a certain number of major Technical Colleges which, if they existed in America, or even if they had existed in Germany before the war, would have received full recognition as industrial Universities. They would have been able to award their own degrees in technology and they might, as was the case in Germany, have come to be regarded as more important to an industrial city than was the older University in the same area, which concerned itself with classics,

literature, the humanities and the basic sciences.

PLANS FOR The question before the country now is—what is to

THE FUTURE be done?

The Senior Technical Colleges in England are asking for full recognition. A National Council has been set up; some ten regional Councils, each with their Academic Boards, have been formed, and the whole matter is being considered both regionally and nationally. What will evolve cannot yet be said, but at any rate a first plan has been drafted—put forward by a Steering Committee composed of Sir Arthur Fleming, Sir Graham Savage and Sir Robert Wood. This plan was submitted to the full National Council, who gave instructions that it was to be submitted to all the Regional Councils, the Professional Bodies, the Local Education Authorities and any others who might be likely to contribute, so that the question should be fully discussed by all concerned. It is this document which has come to the Institution of Production Engineers, and its proposals are of general interest to all members.

In Great Britain at the present time there are many Colleges of Technology, giving full-time courses of instruction, associated in many cases with the particular fields of industrial production in their own areas, the standard of which, in content and duration may be compared with that of University courses leading to the award of a degree. Apart from the Higher Diploma issued by the Ministry of Education and the Professional Bodies, there is no avenue of award for men taking such courses other than the external degree of the University of London. These external degrees, whilst carrying considerable prestige, are limited in that they

cater for but few technologies, i.e. Engineering and Metallurgy. It is becoming accepted that, within the wide and expanding field of technology, the Universities and the Technical Colleges have different but complementary contributions to make. The difference is mainly that whilst the University approach is primarily from the point of view of basic science, in the Technical College scientific theory has arisen out of and been studied concurrently with the practical problems of modern industry on which, by the very nature of close associations within the activities of the locality, the Technical College is particularly well fitted to give helpful guidance to students.

There are, of course, several possible solutions to this national problem and all these have been very fully considered. There is, first, the possibility of the Technical College becoming affiliated with its Local University where one exists; for example, the Manchester College of Technology, the Royal Technical College, Glasgow, and to a smaller extent the Technical College at Sunderland. Universities, taken as a whole, however, do not favour this view and it would not be possible of nation-wide application, although had the relationship been different, it would have been an admirable solution.

In looking for a comprehensive solution, therefore, the Council were faced with either an extension of the present system of London External Degrees to cover all the various technologies; or the creation of some form of national institute. It is by no means certain that London University would be willing to extend their external system; and, in any case, there are serious objections to a solution of this kind. Only one of the recent Reports on Technical Education was in favour of it; and at none of the discussions was such a possibility given serious consideration, largely because of the external nature of the award and the complete control of the courses by an external body which would lay down syllabuses, and set the examinations. It was felt that a rigid control of this nature would make it impossible for the teaching staff to enjoy conditions of academic freedom which are necessary if their status is to be on a par with that accorded to Universities.

The next proposal was to create a new national body which should award a diploma or a degree of Bachelor of Technology. The idea of a national diploma did not find very much favour, since we already have that particular title in connection with the Professional Institutions. A new degree-awarding body, although strongly pressed by the Local Education Authorities, is not likely to be accepted in this country, where the tradition is extremely deeply rooted that only a University Institution should have power to confer degrees.

The National Council, therefore, fell back upon the idea of a Royal Council or College of Technology with a limited number of Fellows, which would admit Members and Associate Members. Such a Council or College when formed, either by Royal Charter or by Act of Parliament, would then recognise certain Colleges or Departments of Colleges, having first subjected to inspection their staff, their Laboratories, their Libraries and their amenities for social and athletic life, and these having proved to be up to standard, would then allow such a College to conduct its own examinations, after having appointed approved external assessors. Students taking the internal examinations of such Colleges would then be awarded the Associate Membership of the Royal College.

From the evidence at the disposal of the Standing Committee of the National Advisory Council it would appear that whatever national pattern for the future organisation of technological education is devised, the establishment of an appropriate award is essential if the position of Technical Colleges in the eyes of industry, the student, and the public is to be enhanced. It is important to emphasise, however, that the creation of a new award at the first

graduating level would not be of lasting benefit unless:-

(a) It were associated with a course requiring an intellectual discipline as rigorous as that of a University course, which might, at the same time, be more suitable than the University course from the point of view of the practical technologist.

(b) It secured recognition by the individual Universities of the country as entitling a man, if he were suitable and so wished, to proceed to University post-graduate study, or to research for a higher University degree.

 It led to separate post-graduate courses and qualifications in technology, which would be open to both those whose

initial study had been in the Technical College and to those who had graduated at a University.

Such a system would give freedom in the way of appointment of staff and development of curricula which the Universities at present enjoy, and it would also carry with it certain other obligations on the part of the Ministry of Education. To give equal opportunities for obtaining the right kind of staff who would have freedom to indulge in research, members of such Colleges would have to be put on an equal footing with their colleagues in the University, and it goes without saying that such conditions would not be obtained under the present Burnham Scales for Teachers or under the sixty per cent grant in the way of financial assistance.

An independent Royal College of Technology, directly financed by the Exchequer or the Ministry of Education, would confer this status, or at least produce the initial impetus for its attainment. For not only would its establishment call the attention of the country to the Government's concern about technology, but it would serve as a fillip to the Authorities to improve conditions in the major Colleges, as an assurance to the teachers of a proper measure of academic freedom, and to the students as an encouragement to embark upon the full-time technological courses which would be started. Further, the Council would be a means of stimulating post-graduate courses in Universities and Technical Colleges alike—a form of education which the U.S.A. have found so useful in the development of their own industries.

Last, but not least in importance, the College would serve as a meeting-ground for the various technologies which are so interdependent in the industrial field and which, though well served by their various professional institutions, generally remain separated from each other. Thus there would be a national forum for the discussion of the many common problems in technology which are

daily arising from invention and research.

That is the situation at the present time, and it illustrates the complexity of the problem. As far as Loughborough is concerned this difficulty has been forseen and to a large extent, although not as yet as far as the finance sections are concerned, a solution has been offered.

LOUGHBOROUGH In 1918, at the close of the first World War, a system of Training on Production was instituted at COLLEGE Loughborough. Even in those days there were long discussions as to the best method of training our young engineers. Should a student take his works training and then go to the University, or should he go to the University first and then, as at Cambridge, take some practical training afterwards? There are difficulties whichever path is chosen and no final decision has ever been reached. If a young man takes the works training first, he goes to College a much more mature person, not feeling disposed to take full advantage of the lighter side of life in the Universitymuch more serious-minded, more intent upon study, and he loses a certain amount of what the University has to give. This is apparent at the present time in students who come to Loughborough under the F.E. & T. Grant System. If a boy goes to the University first straight from school and then, after graduation, goes into works, he has all the difficulty which any University Graduate always finds when entering an industrial concern on the works side, with no knowledge of productive processes and yet with a certain amount of cachet, which does not augur well for mixing with the ordinary workmen. All this points very definitely to some form of the sandwich system as the best solution.



Loughborough College

There are difficulties, of course, with any student entering the modern works at the present time. There is the difficulty of gaining all-round experience. These are days of high wages and mass production. It can be said generally that the best boy gets the least chance. Where the youngster is good at production in a particular department there is a tendency to keep him there where his earning capacity is greatest.

There is to-day little connection between the office side and the productive works, and the bigger the firm the less the connection, so that a young man entering practical industry gains little experience of what, for want of a better term, could be called 'the soul

or spirit of the firm '.

There are also our difficulties on the academic side. There is a great tendency for our Colleges and Universities to become industrial museums, good in their way, but quite unrepresentative; plant is not worked out but becomes obsolescent. There is too, a great tendency to become absorbed in a purely academic curriculum. Mathematics and Physics, and cognate subjects loom large and under the present examinations of the University of London little attention is allocated to Management and questions like Marketing and Sales.

The question of equipment becoming obsolescent is a real

practical difficulty for the Technical College and for the University. Slowly but surely the interest of industry is awakening to the fact that equipment, either given or purchased, should be typical of the latest processes in industry—the old idea of giving to the College things which were of no further value is, fortunately, disappearing.

There have been many examples of the sandwich TRAINING ON system such as that operated by Faraday House and **PRODUCTION** the excellent ones by Metropolitan Vickers, W. H. Allen and others. With these in mind and as the result of experience gained of American technical education, their different systems of co-operative training, and the work of the University of Cincinnati, the Massachusetts Institute of Technology at Boston, the Worcester Polytechnic, and Colleges and University Institutions in many other American cities, a system of Training on Production was commenced at Loughborough. Its significance is that exercises have been abolished, and manufacture is carried out for the purpose The immense advantage of this has to be seen to be of training. The students work one week in the productive shops and then have one week in classes—an ideal sandwich. Psychologically to realise that their work is of value and that it is going to be used by someone else is overwhelming, and nothing could be more deadly or uninteresting than the Technical College workshop which is maintained solely upon exercises. The work has to be accurate. In other words it is real—customers are not expected to be philanthropists. If the work is not up to standard, it is rejected. To give you the medical analogy—no medical school of any repute turns out its men who have only had experience on exercises. Some real person with a real injury is involved. Training must involve practical experience with a purpose, carried out under expert and individual supervision.

There are, of course, difficulties. The instructor has to be a somewhat unusual man, sympathetic with students, patient and helpful. Large quantities of scrap must be avoided; on the other

hand, so must an over-careful approach.

Furthermore both organised labour and organised capital have been particularly helpful. The question of delivery is, of course, the main difficulty but fortunately, under present circumstances deliveries, in spite of unusual difficulties, are not much different from that of the productive firm. The great advantage of the system is its element of reality and interest.

The shops are equipped with some three hundred and fifty machine tools. There are all the conditions of a widely diversified firm—a foundry, a pattern shop, drawing offices, machine shops, electrical fitting and winding shops, garage and automobile repair shops, grinding, milling and automatic shops. Power and

light are generated and a sufficient supply of work of an interesting kind can always be secured to keep everyone fully employed.

From the beginning successful students were awarded the Diploma of Loughborough College, of which there must be thousands now in all parts of the world. It is given as the result of not less than three years residence in the College. It is given with First and Second Class Honours and Pass Awards and it connotes a good academic standard together with a knowledge of Works Processes in many sections of the engineering industry, not necessarily a training as a skilled workman in such work. The students do know, however, what it is to knock up a box in a foundry. They have to keep the power plant going or they would be in darkness, they do see the work they have produced in use all over the country, and not left in the scrap box as material for the next student to use.

Students who come with Matriculation, Higher School Certificate or London Intermediate can, and do, take the London Honours degree. Students who come with certain qualifications have their Honours Diploma fully recognised in lieu of any further examination for the Associate Membership of the Institution of Civil Engineers. The diploma is similarly recognised as exempting from examinations of the Institution of Production Engineers. It is also recognised by the Institution of Electrical Engineers and whatever the National Committee may finally decide to recommend, Loughborough has to a large extent solved the problem and it is along similar lines that the national solution is likely to lie.

NATIONAL In National Certificate Schemes there is a great deal to be said in favour of a Common Ordinary National CERTIFICATES Certificate, common to all the Institutions, Civil, Mechanical, Electrical, Production, etc.—because up to Ordinary National Certificate standard certain elementary subjects are necessary for any engineer, whatever may be his special interests. If, however, agreement cannot be reached on that, and apparently it cannot, then an Ordinary National Certificate for the Production Engineer is necessary because of its influence on a student's decision as to his future studies. A large number of students, having taken ordinary National Mechanical, proceed further with Higher National Mechanical, and are thus lost to the Institution, unless advised and guided by Principals of Colleges and Heads of Departments as to what is likely to be most beneficial to them in their future careers.

Illustrations have been given of the Loughborough College system—there are many others, all of value, but what is of outstanding importance is to remember that the good Production Engineer is concerned with better methods of increasing output, rather than with a comprehensive knowledge of the basic sciences, excellent though these are for those who have use for them.

Notes

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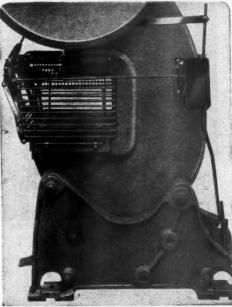
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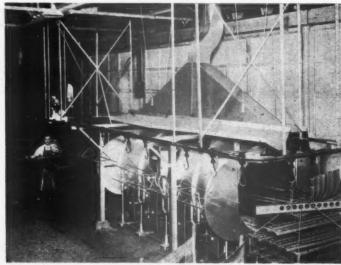
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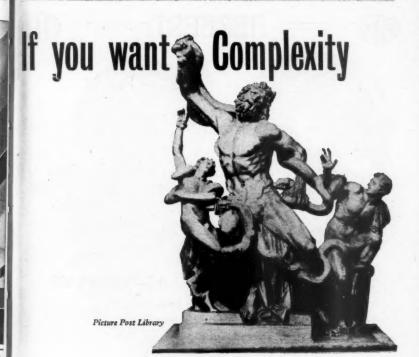
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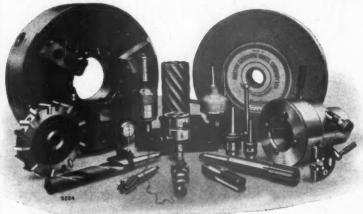
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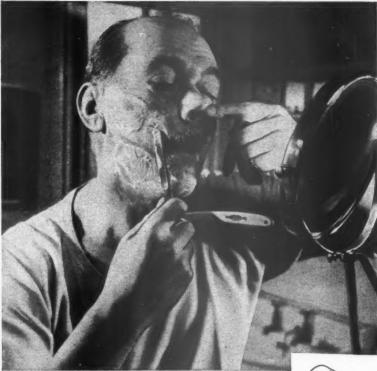
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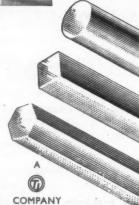
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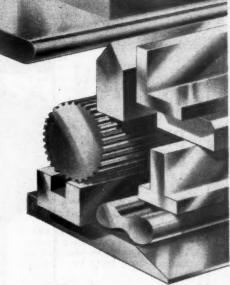
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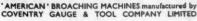
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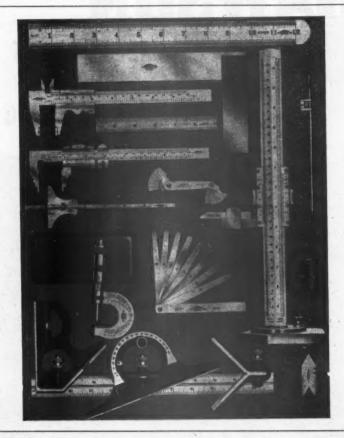
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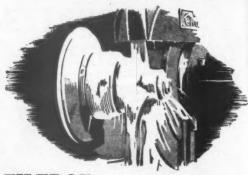
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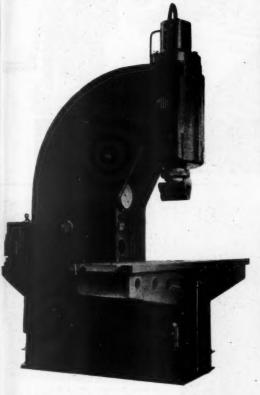
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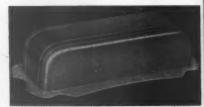
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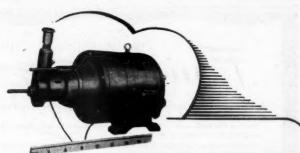
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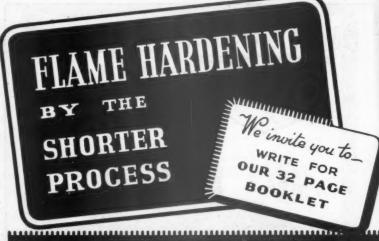
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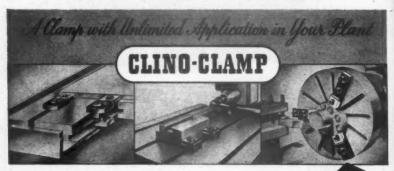
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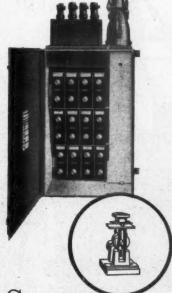


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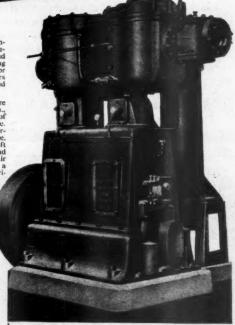
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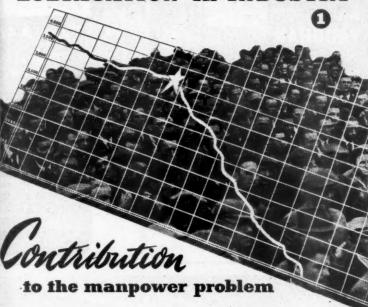
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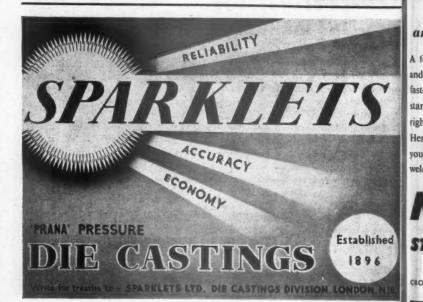
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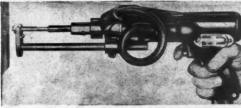
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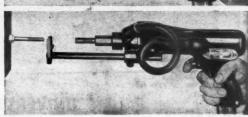
16



TWO



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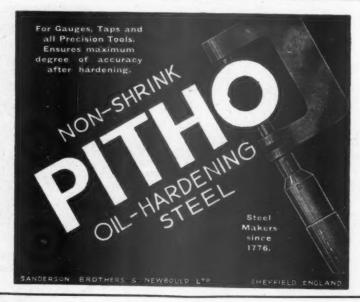
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INDEX TO ADVERTISEMENTS

				Page	1		Page
Abwood Tool & Engineering Adam Machine Tool Co., Ltd Ajax Machine Tool Co. Ltd. Arcon, Tropical Products Automatic Coil Winder and	Co. Lt	d.		-	Lancashire Dynamo & Crypto, Ltd.		. Lvii
Adam Machine Tool Co., Led	ı.	***	***	LViii	Lang, John, & Sons, Ltd Lloyd, Richard, Ltd	*** ***	
Ajax Machine Tool Co. Ltd.	***	***	***		Lloyd, Richard, Ltd	***	. xxvii
Arcon, Tropical Products	Electric	E		LXVII	Lund, John, Ltd		. Liii
ment Co. Ltd	Election	can Ed	uip-	xxviii			
ment co. cta.	***	***			Mercer, Thos., Ltd Mills, John & Co., (Llanidloes), Ltd.		
					Mills, John & Co., (Llanidloes), Ltd.		
Barber & Colman, Ltd. Benton & Stone, Ltd Birlec, Ltd	***		***	viii	Mollart Engineering Co., Ltd Monks & Crane, Ltd Morgan, George, Ltd	*** ***	a annu t
Benton & Stone, Ltd	***	***	***	-	Monks & Crane, Ltd	*** ***	. xvi
Birlec, Ltd	***	0021	***	-	Morgan, George, Ltd	*** **	
Birmingham Aluminium Car	sting (1	903)	Co.		MOTOR Gear & Engineering Co., Ltd.		
Birlec, Ltd. Birmingham Aluminium Cas Ltd. Bratby & Hinchliffe, Ltd. British Steel Founders' Asso	***	***	×	xxviii	McKechnie Bros. Ltd	***	. —
British Steel Founders' Asso Brooke Tool Manufacturing	ciation			ix			
Brooke Tool Manufacturing	Co. Ltd	., The	***	_	Newall, A. P., & Co., Ltd		. vii
Brooks & Walker Ltd.	***	***		-	Newall, A. P., & Co., Ltd Newall Group Sales Ltd	***	. XLi
Brooks & Walker Ltd. Broom & Wade Ltd Burton, Griffiths & Co. Ltd.	***	***	***	LXi	Norton Grinding Wheel Co., Ltd.	*** **	. xii
Burton, Griffiths & Co. Ltd.	***	***	***	xiii			
					01-0-10-0-1-1		
Camerer Cuss				LX	Osborn, Samuel & Co., Ltd	*** **	
Camerer Cuss Catmur Machine Tool Corpo Central Tool & Equipment C Chesterman, James & Co., L Churchill Charles & Co., L	oration.	Ltd.		XLV			
					Parkinson, J., & Son (Shipley) Ltd.		. iv
Chesterman, James & Co., L	ed.	***		XLVIII	Parsons Chain Co. Ltd.	***	
Chesterman, James & Co., L Churchill, Charles & Co., Lt Churchill Machine Tool Co., Cincinatti Milling Machines,	d	***	***	-	Pitman, Sir Isaac & Sons Ltd		
Churchill Machine Tool Co.,	Ltd., T	ne	***	water.	Procter Bros. (Wireworks) Ltd.		. LX
Climax Rock Drill and Eng	Ltd.	- W-	eke.	ALIV	Protolite, Ltd	*** **	. xxxii
Ltd	ineer mi		, ma,	xxi	Pryor, Edward, & Son, Ltd	*** **	. Lvi
Callie I R Cone Lad				Count	Parsons Chain Co. Ltd. Pitman, Sir Isaac & Sons Ltd. Procter Bros. (Wireworks) Ltd. Protolite, Ltd. Pryor, Edward, & Son, Ltd. Pultra, Ltd.	*** **	. –
Coventry Gauge & Tool Co.	, Ltd.	***	***	xvii			
Craven Bros. (Manchester) l	.td.	***	***	_	Resuell & Co. Ltd.		KLVi
Coventry Gauge & Tool Co. Craven Bros. (Manchester) I Crompton Parkinson, Ltd.	***	***	***	LXV	Rockwell Machine Tool Co., Ltd.		XXXIX
					Reavell & Co., Ltd Rockwell Machine Tool Co., Ltd.		
Dawson Bros 1rd				XLVII			
Dawson Bros., Ltd Dean, Smith & Grace, Ltd. Deloro Stellite Ltd	***	***	***	xxix	Sanderson Bros. & Newbould, Ltd.		. LXVi
Deloro Stellite Ltd	***			xxxi	Schrader's, (A) Son Scrivener, Arthur, Ltd	*** **	
					Sheffield Twist Drill & Steel Co. Ltd	The	XXV
Dowding & Doll, Ltd	***	***	***	xxiii	Smart & Brown, (Machine Tools), L.	ed	. Lii
Dowding & Doll, Ltd Drummond Bros., Ltd. Duckham, Alexander & Co.,	Lad	***		жv	Sparklets Ltd		LXiV
Ducknam, Alexander & Co.,	Ltd.	***	***	XLI	Sparklets Ltd Spencer, Franklin Ltd Spencer & Halstead Ltd		. vi
					Spencer & Halstead Ltd	td	
Electro, Dynamic Constructi English Electric Co. Ltd., Th Exors. of James Mills, Ltd.	ion Co.,	Ltd.	***	_	Steel Band Conveyor & Eng., Co., L	td	=
English Electric Co. Ltd., Th	e		***		Sterling Metals Ltd	*** **	. 131
Exors. of James Mills, Ltd.	***	***	2	COEVII	Steel Band Conveyor & Eng., Co., L Sterling Metals Ltd Sunbeam Anti-Corrosives, Ltd. Swift, Geo., & Son, Ltd Sykes, W. E. Ltd	*** **	
					Sykes, W. E. Ltd	x	viii, xix
Fescol, Ltd Firth, Brown Tools, Ltd. Flame Hardeners Ltd	***			_			
Firth, Brown Tools, Ltd.	***	***	***	XLiii	- airing and a color		
Flame Hardeners Ltd	***	***	***	LVIII	Talbot-Stead Tube Co. Ltd	***	. XXXVi
Fletcher Miller Ltd	***	***	***	L	Taylor & Jones, Ltd Tecalemit Ltd		
1						oun The	EXIII
Gill, Samuel & Sons (Engineer					Towler Bros. (Patents) Ltd.	oup, in	. LV
Gledhill-Brook Time Record	are i.rd			XLIX	Towler Bros. (Patents) Ltd Tyne Truck & Trolley Co. Ltd.		
G.P.A. Tools & Gauges, Ltd.		***	***	XL			
G.P.A. Tools & Gauges, Ltd. Guest, Keen & Nettlefolds (Guylee, Frank, & Son, Ltd.	Midland	is, Led	1)	_	Unbrako Socket Screw Co., Ltd. Universal Tools, Ltd		. xiv
Guylee, Frank, & Son, Ltd.	***	Inside	Back	Cover	Universal Tools, Ltd	*** **	LXii
					,	***	
Hall, Matthew & Co., Ltd. Harrison, T. S., & Sons, Ltd. Havelock Engineering, Co., High Speed Service Tool Co Herbert, Alfred, Ltd. Hilger & Watts, Ltd. Holman Bros. Ltd. Hoover, Ltd.				wwii	I was a summary of the		
Harrison T S & Sons Ltd.	***	***	***	AAII	Van Moppes & Sons (Diamond Tool	s) Ltd	
Havelock Engineering, Co.	Ltd.	***	***	_	Vaughan, Edgar, & Co. Ltd Vaughan, Crane Co. Ltd Vickers-Armstrongs Ltd	*** **	
High Speed Service Tool Co	Ltd.		***	Liv	Vaughan, Crane Co. Ltd	***	. LEIV
Herbert, Alfred, Ltd	***	XX	cxiv,	XXXV	Vickers-Armstrongs Ltd	***	
Hilger & Watts, Ltd	***	***		-			
Holman Bros. Ltd Hoover, Ltd Hordern, Mason & Edwards, Hoyt Metal Co. of Great Bri	***	***	Back	Cover	Ward, H. W., & Co., Ltd		v
Hordern Mason & Edwards	Led	***	***	XXVI	Ward, Thos. W., Ltd.	***	xxiv
Hoyt Metal Co. of Great Bri	tain Lee	4.	***	Liv	Ward, H. W., & Co., Ltd Ward, Thos. W., Ltd Wickman, A. C., Ltd	***	. x, xi
THE PROPERTY OF GREAT BY			***	and 4	VVIIIIams & James (Engineers) Ltd.	*** **	=
					Wickman, A. C., Ltd Williams & James (Engineers) Ltd. Wild Barfield Electric Furnaces Ltd. Wolverhampton Die Casting Co., L		
Imperial Smelting Corporation	on (Sale	s), Lt	d	xxxiii	Wolverhampton Die Casting Co., L	id	. XXX
The state of the s							
Johansson, C. E., Ltd				-	Young, John S. & Co., Ltd		_
	***	***	***	_			
w							
King, Geo. W., Ltd	***	***	***	xx	Zinc Alloy Die Casters Association		

Page Lvii XXVII Liii LXVi XVi vii XLi Xii LXK LX XXXII LVI XLVi XXXiX LXVI

XXV
Liii
LXiV
VI

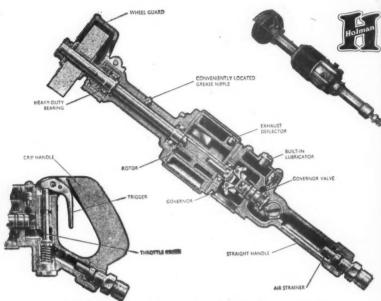
iiii

iiii, xix xxxvi LXIII LVI LV xiv Lxii LXiv xxiv x, xi





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